UNEP
For Life on Earth

industry and environment

ISSN 0378-9993
Industry and Environment
Volume 20 No. 3
July – September 1997

A publication of the United Nations Environment Programme
Industry and Environment – UNEP IE

Une publication du Programme des Nations Unies pour l'environnement
Industrie et Environnement – PNUE IE

Una publicación del Programa de las Naciones Unidas para el Medio Ambiente
Industria y Medio Ambiente – PNUMA IMA

Industrial accidents: prevention and preparedness

- Fixed installations
- Transport
- Ports
- Learning from recent accidents
- APELL implementation

Industry and Environment is a quarterly review published by the United Nations Environment Programme, Industry and Environment (UNEP IE), Tour Mirabeau, 39-43 quai André-Citroën, 75739 Paris Cedex 15, France. Tel: +33 01 44 37 14 50; Fax: +33 01 44 37 14 74; E-mail: unepie@unep.fr; http://www.unepie.org

Director

Jacqueline Aloisi de Larderel

Editorial Board

Tore Brevik
Michael Chadwick
Ossama El-Kholy
Claude Fussler
Nay Htun
Ashok Khosla
William H. Mansfield III
Haroldo Mattos de Lemos
Walter Retzsch
Arsenio Rodriguez
Léon de Rosen
Sergio C. Trindade

Editorial Staff

Françoise Ruffe
Geoffrey Bird
John Smith
Thalia Stanley

Editorial Policy

The contents of this review do not necessarily reflect the views or policies of UNEP, nor are they an official record. The designations employed and the presentation do not imply the expression of any opinion whatsoever on the part of UNEP concerning the legal status of any country, territory or city or its authority, or concerning the delimitation of its frontiers or boundaries.

The non-copyrighted contents of this review may be reprinted without charge provided that **Industry and Environment** and the author or photographer concerned are credited as the source and the editors are notified in writing and sent a voucher copy.

Industry and Environment welcomes for possible publication feedback from readers, news on their sectors of activity, or articles. The editors cannot guarantee publication nor return of unsolicited manuscripts, photographs and artwork. Manuscripts which do not conform to the conventions and standards of the review may be returned for revision.

Subscriptions

Industry and Environment is subject to an annual subscription fee of US$ 60.00. See back page for order form. Upon application to the Director, submitted on letterhead, the annual subscription charge may be waived for government, educational and non-profit organizations in developing countries who are unable to remit payment.

Contents

◆ Industrial accidents: prevention and preparedness

3 Editorial
4 Facts and Figures – Industrial accidents: an everyday occurrence
7 A US perspective on chemical accident prevention, risk management and inherent safety – *by Jim Makris*
10 CHEMTREC®: the CMA's Chemical Transportation Emergency Center – *by Henry J. Sauer*
12 The ICE initiative: chemical transport safety in practice in Europe – *by Filip Jonckheere*
16 Pipeline emergency response in CEPA member companies – *by the Canadian Energy Pipeline Association*
18 OECD Workshop on Pipelines
19 APELL in Chile: towards a port-oriented strategy – *by Alberto Maturana Palacios*
22 Prevention of industrial accidents in the Arctic – *by Ulf Bjurman*
28 Capacity building in management of chemical accidents in India – *by V. Srinivas Chary*
30 Risques industriels : l'intérêt des bases de données sur les accidents – *by Hubert Baratin*

34 APELL Case Studies

34 Introduction
36 The development of UNEP's APELL programme in Shanghai – *by Yang Sen*
37 Proceso APELL Barranquilla, Colombia – *by the Barranquilla APELL Group*
42 The APELL programme in the Czech Republic – *by Milos Palecek*
43 The Manali-Ennore Industrial Area near Madras: implementation of the APELL/LAMP Programme – *by R.R. Umakanthan*
44 APELL: the UK approach
46 The introduction of risk management in Jelgava, Latvia – *by Andris Maurans*
49 World Environment Center: progress in implementing APELL in selected countries
50 Gestion des risques industriels majeurs : expérience du Groupe Chimique Tunisien, région de Gabès – *by Le Groupe Chimique Tunisien*
52 Activities of the OECD Chemical Accidents Programme related to APELL

◆ Other topics ◆ Autres sujets ◆ Otros tópicos

54 Waste minimization: water use in a Kenyan milk powder factory – *by Michael W. Okoth*
58 How can we substantially increase eco-efficiency? – *by Jacqueline Cramer*

◆ Newsletters ◆ Bulletins ◆ Boletines

63 Cleaner Production
67 EnTA

◆ News ◆ Actualités ◆ Actualidades

71 World News
74 Industry Updates
76 UNEP Focus
79 Books and Reports

◆ Sections ◆ Rubriques ◆ Secciones

90 Feedback

Accident prevention and preparedness: protecting people and the environment

Within a decade of the accidental gas release at Bhopal in India, at least 4000 people had died as a result of this well known industrial disaster. Thankfully, there has not – so far – been another Bhopal. However, serious technological accidents happen every day somewhere in the world, causing deaths, injuries, and damage to the environment. In industry, as in other activities, specialists assure us that zero risk will never be attained. It is therefore up to governments and industry to reduce the probability of accidents occurring to a level which is acceptable to society, and to prepare populations for emergency response should an accident occur. In short, accident prevention and preparedness are key elements in the promotion of sustainable production patterns.

It was in 1988, just a few years after the Bhopal disaster, that *Industry and Environment* last focused on the environmental consequences of major technological accidents. UNEP also launched its Awareness and Preparedness for Emergencies at Local Level (APELL) programme in 1988, in conjunction with governments and the chemical industry. APELL has established itself (within the range of activities of international organizations on accident prevention and preparedness) as a practical programme which assists industry, public authorities, and communities at the local level to increase community awareness of technological hazards and to prepare integrated plans for effective response should accidents occur. The quality of response to what might seem a minor incident at a facility or during transport of hazardous materials is often the determining factor in ensuring that such an incident does not become a major disaster. Promotion of the APELL programme as the means to achieve these ends was recommended in 1992 in UNCED's Agenda 21.

APELL was originally based on the Community Awareness and Emergency Response (CAER) programme, which later became part of the chemical industry's Responsible Care® initiative. It also included elements of the European Union's "Seveso" Directive and the United States' Right-to-Know initiative. UNEP's focus on developing countries has meant that APELL is able to reach places and stakeholders which Responsible Care does not. This issue of *Industry and Environment* presents case studies illustrating how the APELL process has been implemented in communities in different parts of the world. These case studies will be of interest to current and potential APELL users, as well as being of general interest to many of our readers. This special issue also looks at some of the new areas into which APELL is likely to expand.

From its origins in the chemical industry APELL is branching out, functioning in this way as a vector for the sharing of experience and technology. As the programme enters its second decade, it is beginning to address emerging issues such as accident prevention and preparedness in ports (a publication on this subject has already been produced in collaboration with the International Maritime Organization) and is extending its range from fixed to mobile installations by addressing accidents arising from the transport of hazardous materials. Work in the latter area is going ahead with help from Sweden, in the form of the TransApell initiative. Pipeline safety is another major issue for many countries. There is a call for UNEP to work with industry, particularly the oil industry, to produce guidance. Recently, there has also been a call to apply the principles of APELL to safer production and to community relations in the Arctic Region.

The 1990s are the International Decade for Natural Disaster Reduction. Activities undertaken as part of this initiative have brought a greater understanding of the connections between natural and technological disasters. This is particularly important in an era of increasing urbanization. An apparently "natural" disaster such as a landslide may, for example, be caused by human activities. If there is a chemical plant in its path, this may in turn spark off an industrial disaster. These combination disasters are called "Na-Techs" ("Na" for natural, "Tech" for technological). Civil defence organizations are becoming increasingly conscious of the need to consider the possibility of technological accidents in their planning, and are involving local industry in the planning process. They are also becoming aware of the need for a more preventive approach. Cleaning up after a disaster of any kind can be compared to the "end-of-pipe" approach to pollution control. Prevention is always better than cure.

Technological solutions alone will not be sufficient to ensure continuing growth of an accident prevention and preparedness culture. Prevention and preparedness need to be woven into management structures. Indeed, their incorporation into Environmental Management Systems, which has been the hallmark of Responsible Care, has recently been further stimulated by their inclusion in ISO 14001, which requires companies to establish and maintain procedures for identification of potential causes of accidents, for response to accidents and emergency situations, and for the prevention and mitigation of their environmental impacts. The ISO standard also recognizes that analysing accidents and emergencies after they happen can be a valuable tool for improving safety and increasing preparedness, by including a requirement for review and revision of procedures in the light of those incidents which occur. It also specifies that, whenever practicable, procedures should be tested. Companies wishing to translate such framework proposals into actions will find the APELL approach helpful in building up solid internal management structures for prevention and preparedness.

Preparedness, of course, requires increased communication with populations in the vicinity of potentially hazardous installations. Legislation introduced to bring this about tends, like ISO 14001, to provide a framework and specify requirements but not to specify methods. For example, the EU's 1988 "Seveso" Directive, by stipulating that members of the public liable to be affected by a major accident must be informed of safety measures and of how they should behave in the event of an accident, presented new challenges concerning how to communicate within the context of European cultural and legislative diversity. As rapidly industrializing countries become increasingly aware of the need for such communication, they will face the same challenges. Here again, the APELL approach will prove useful in helping define which links should be established and with whom, as well as how to effectively communicate information about risks and preparedness measures within communities.

Accidents kill and injure people, damage the environment and property, and waste resources. In those areas of the world which are rapidly expanding their industrial base, some of the accident patterns discerned in developed countries are already being repeated. There is an ongoing need for accident prevention, to keep the number of accidents to a minimum, and for preparedness, to minimize the consequences of any that do occur. This need was recognized at the 1997 United Nations General Assembly Special Session – New York (UNGASS), convened to review progress on the implementation of Agenda 21. The UNGASS programme states that "major technological and other disasters with an adverse impact on the environment can be a substantial obstacle in the way of achieving the goals of sustainable development in many countries," and recommends that the international community increase its efforts in regard to cooperation to avoid such disasters. We hope decision-makers in governments and industry will find this issue of *Industry and Environment* useful in their efforts to implement the UNGASS recommendations. ◆

Facts and Figures
Industrial accidents: an everyday occurrence

As technology has developed, so have the risks associated with it. In industry, where large amounts of energy are converted heat or used to power potentially dangerous machinery, and where inherently dangerous substances are stored, mixed and used in a wide range of processes, the risks often extend well beyond the boundaries of the plants themselves. In this context there have been some landmark events, such as the release of toxic gas at Bhopal (India) in 1984, which temporarily focused public attention on the dangers of industry. However, what happened at Bhopal was exceptional because of the appalling scale of the consequences, not because of the type of accident. Dangerous chemicals are accidentally released every day somewhere in the world. There are also fires, explosions, and combinations of the two resulting from industrial activities, transport, and other causes.

Major industrial hazards are generally associated with the possibility of explosion, fire, or the release and dispersion of toxic substances, with some installations combining some or all of these threats.

Explosions

The word *explosion* is used to cover all the processes characterized by a sudden flow of material (usually consisting mostly of hot gases) outward from one point. There are two main types of explosion, depending on the causes of this outflow: explosions resulting from physical processes, and explosions resulting from chemical reactions. Explosions resulting from physical processes include pressure vessel and steam explosions; those resulting from chemical reactions occur when exothermic (heat-producing) reactions provide the energy for the flow. Explosions can occur in the form of either a deflagration or a detonation. Deflagration occurs when the burning velocity is relatively slow – around 1 metre per second (m/s). When a detonation occurs, the flame speed is very high (typically 2000-3000 m/s). A detonation therefore generates far greater pressure and is far more destructive than a deflagration.

Explosions are characterized by the production of a shock wave which can cause damage to buildings and eject missiles over long distances. People in the near vicinity of an explosion can be killed or injured by the over-pressure, but the study of industrial explosions shows that far more casualties are due to collapsing buildings and to flying glass and other debris.

Dust explosions and releases

A common cause of explosions, and one which has caused problems for many years in the agro-food industry in particular, is dust. Dust explosions occur when flammable solid materials are extensively mixed with air. An explosion usually follows an initiating event such as a fire or small explosion which causes powder that has settled to become airborne. When the dust mixes with air, there is a second explosion which in turn creates a third, and so on. The consequences can be extremely serious. Such an accident this summer in southwestern France killed 11 workers and destroyed the plant. The study of dust explosions in recent years shows that damage is most often confined to the plant, rather than harming those living around it. Even when there is not an explosion, dust can still present a risk if it is released as a cloud, especially if it contains toxic substances. **Table 1** gives details of some recent accidents involving dusts and powders.

Fires

Fire is the release of energy during the oxidation of a "fuel" (i.e. the substance being burned), with most of the energy being in the form of heat. Fires, which happen more often in industry than do explosions, may be of several types including jet fires, pool fires, flash fires, and boiling liquid expanding vapour explosions (BLEVEs). A jet fire is a narrow flame produced, for example, when a leak from a gas pipeline is ignited. A pool fire results from the ignition of a spillage of oil or other flammable substances. A flash fire occurs when escaping gas reaches an ignition source and rapidly burns back to the point of release. BLEVEs, which involve a combination of powerful explosion, rapidly expanding hot gas clouds, and fire, are common throughout industry due to the large number of liquids and gases used and transported. **Box 1** gives more information about BLEVEs including some idea of the human cost. The consequences of a BLEVE (fireball) are usually far more serious than those of other types of fire.

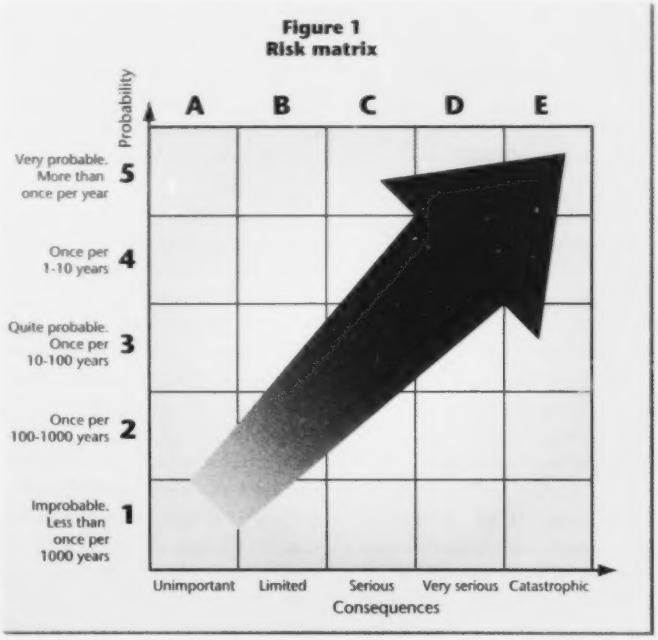
Toxic releases

A toxic release is the uncontrolled release of a substance that is poisonous or harmful to property or the environment. Industry uses and transports very large quantities of substances which present such a risk. Extreme care must be taken to ensure the containment of these substances. Once they are released, they can be transported by the receiving media (air, water, soil, etc.) over great distances. Toxic substances released and dispersed in this way can be a major source of morbidity and fatalities.

The toxicity of a substance is determined from studies of incidents involving the substance, epidemiological studies, animal experiments, and microorganism tests. However, other factors must be taken into account, such as the exposed individual's age, sex, genetic background, nutrition, fatigue, and exposure to other substances with synergistic effects.

Toxicity data are not available for many substances. However, for those such as chlorine (one of the chemi-

Figure 1
Risk matrix



Box 1
Boiling Liquid Expanding Vapour Explosions (BLEVEs)

A feature of many technological accidents is that their consequences are felt far beyond the boundaries of the plants or installations in which they occur. One common mechanism by which this can occur, and which often has devastating effects, is the Boiling Liquid Expanding Vapour Explosion or BLEVE.

Sometimes referred to as a fireball, a BLEVE is a combination of fire and explosion with an intense radiant heat emission within a relatively short time interval. The phenomenon can occur within a vessel or tank in which a liquefied gas is kept above its atmospheric boiling temperature. If a pressure vessel fails as a result of a weakening of its structure, the contents are instantaneously released as a turbulent mixture of liquid gas, expanding rapidly and dispersing in air as a cloud. When this could is ignited, a fireball occurs, causing enormous heat-radiation intensity within a few seconds. Depending on the quantity of gas involved, this heat intensity may be sufficient to cause deaths and severe skin burns at several hundred metres from the vessel.

A BLEVE can be caused by a physical impact on a vessel or tank which is already overstressed or damaged, for example from a traffic accident involving a road or rail tanker, or it can be caused by fire impinging upon or engulfing a vessel and thus weakening its structure. A BLEVE involving a 50 tonne propane tank can cause third-degree injuries at a distance of around 200 metres and blisters at around 400 metres.

The cost in human terms

So much for the technical aspects. However, where such accidents occur, the cost is often not to be counted in terms of wrecked equipment and repair bills, but in terms of human tragedy.

One of the worst recorded accidents in which the BLEVE caused severe damage and tragedy occurred in a chemical plant at San Juan Ixhuatepec (Mexico) in 1984. In this case, fire from a gas leak led to a series of explosions resulting in around 500 deaths, more than 2,000 cases of severe burns, and the evacuation of 60,000 people. Most of the damage and loss of life occurred when four spherical storage tanks each containing 1500 m³ of liquefied petroleum gas (LPG), and other smaller tanks "BLEVE-ed" (to use the specialist jargon), causing massive fireballs and hurling fragments weighing between 10 and 40 tonnes over 900 metres. In the following passage one of the victims recounts his own story.

"I went to the market to open my shop at 5:30 a.m. After a few minutes a terrible noise followed by an earthquake started everything off. The sky was red and there was fire everywhere. When I arrived at my shop, I heard an explosion followed by an earthquake. I saw a fire in the sky. Several houses caught fire, dogs were barking and running loose. I grabbed a piece of wood to protect myself from the fire and ran back to my house that was on fire. I shouted for my wife and children to come out, but they did not listen to me. I grabbed a bucket and threw water on the house. As soon as I had managed to kill the fire I went inside and found my scorched family."

The bodies of this man's wife, aged 30, and his four children, aged 10, 7, 4 and 2, were found in the debris of the house. In the house next door, a family of 10 were killed.

Urban planning and accident prevention

The proximity of buildings to the plant was one of the major causes of the large number of injuries and fatalities. In the overpopulated Mexico City area in the San Juanico Valley, the free area around the plant had gradually shrunk under the pressure of urban migration. At the time of the accident, the closest dwellings were only 130 metres from the tanks. At a distance of 400 metres the population would at least have been protected from the heat of the fireball, even though some damage would have been sustained from flying debris.

Although it is difficult to set a safe distance limit, phenomena such as the BLEVE must be taken into account if such tragedies are to be prevented.

als most often handled in quantities which present a major risk) these data do exist. Chlorine is fatal at concentrations of 100-150 parts per million (ppm) for exposures of five to 10 minutes. It is also known that an instantaneous release of ten tonnes of chlorine can result in concentrations of 140 ppm (within the fatality bracket) at a distance *up to two kilometres* downwind from the source.

Other substances are far, far more toxic, and must be used and controlled with particular care. Dioxins, a family of 210 chlorinated organic compounds of which 17 are toxicologically significant, are manufacturing impurities in certain industrial processes and can also be released when compounds containing chlorine are burnt at low temperatures. To give an idea of the their toxicity, the standard which has been set for Swedish waste incinerators is a maximum of 0.1 ng/m³, that is, a maximum of 1 gram of dioxins in at least 10,000,000,000 m³ of flue gases emitted.

The rapid growth in the use of hazardous chemicals in industry and trade has brought about a very significant increase in the number of people, both workers and members of the general public, whose lives could be endangered by an accident involving these chemicals.

Table 2 shows a very tiny sample of the many industrial accidents which occurred around the world in 1996 and 1997. It can be seen that they have mostly involved the phenomena described above, with similar patterns and similar consequences occurring everywhere. The causes, too, are only too familiar: for example, leaking valves, electric sparks, sparks from welding and cutting operations. In other words, the same pattern of human error, lack of vigilance and inadequate maintenance is repeated worldwide. Modern technology is moving ahead at a rapid pace, but it too often leaves human tragedy and environmental damage in its wake.

Accident analysis and risk assessment

As human beings, we are able to learn from our past errors and learn to avoid what has harmed us in the past. Historically, this has been the intuitive

Table 1
Accidents involving dust and powders

Year	Place	Plant Type	Substances	Description
1995	Germany	Chemical plant	Naphtol	Explosion: During production of colouring agents, an employee struck a naphtol mixing machine in order to free a blockage. The napthtol began to flow very quickly and the resulting dust cloud was ignited by a static discharge. In the resulting deflagration two employees suffered 3rd degree burns.
1995	USA	Chemical plant	Aluminium powder and sodium hydrosulphite	Explosion: Cleaning water from a blocked pipe accidentally flowed into a reactor containing aluminium powder and sodium hydrosulphite causing hydrogen sulphide to be given off. During attempts to stabilize this situation, an explosion occurred killing 5 employees and injuring 9,900. People had to be evacuated from around the plant.
1996	Spain	Silo	Soya	Dust cloud: During unloading of soya in the purt of Barcelona, dust escaped from the silos into which the soya was being transferred. The unfavourable atmospheric conditions caused concentration of a cloud over the city. Many people suffered asthma attacks, 30 were admitted to hospital, and 2 people died.
1997	France	Food processing plant	Grain	Fire: A spark from a malfunctioning electric motor ignited dust from a grain silo. Actions by personnel using unsuitable CO_2 fire extinguishers caused dispersion of incandescent particles and spread of the fire. The fire was eventually brought under control by the fire brigade.

Source: SEI/BARPI ARIA database, Ministry of Environment France

approach to reducing accidents. When multiple injuries or fatalities occur, there are almost invariably calls for increased controls to ensure that such an event can "never happen again", and measures are often introduced for this purpose.

The analysis of accidents has shown that they are the result of a chain of events, often starting with a relatively trivial incident which (either because it goes unnoticed, or because of inappropriate response) sparks off a chain reaction that can rapidly lead to a catastrophe. Examining such chains of events provides valuable lessons, and much of the safety legislation and many of the standards currently in force are based on the results of accident investigations. In laying down rules which will avert accidents (i.e. adopting a prescriptive approach), risk assessment and management are to some extent implicit in existing regulations. However, there is now a growing trend towards a more predictive approach, giving risk assessment a far more explicit role in the determination of safety parameters.

Many methods and systems, of varying degrees of complexity, have been devised to assess risks in many different fields. **Figure 1** shows an example of a risk matrix suitable for ranking risks as an aid to decision-making. In other circumstances, for instance to ascertain whether an industrial installation is below some pre-defined upper level of risk, more complex quantified risk analysis may be necessary. Countries such as Australia, the Netherlands and the UK are increasingly using numerical criteria to assess the acceptability of risk in terms of safety. One approach used in the UK is the ALARP (As Low As Reasonably Practicable) triangle, in which an upper not-to-be-exceeded limit and a lower negligible-risk limit are established. Between them is an area where risk reduction measures must be considered and discussed on the grounds of reasonableness and cost-benefit. **Figure 2** shows the ALARP triangle and the values used in the UK.

Risk assessment is a fairly new and growing science which is being pushed forward by the increasing use of databases (like ARIA, described in this issue of *Industry and Environment*). The examples given here are only two of many different approaches and systems.

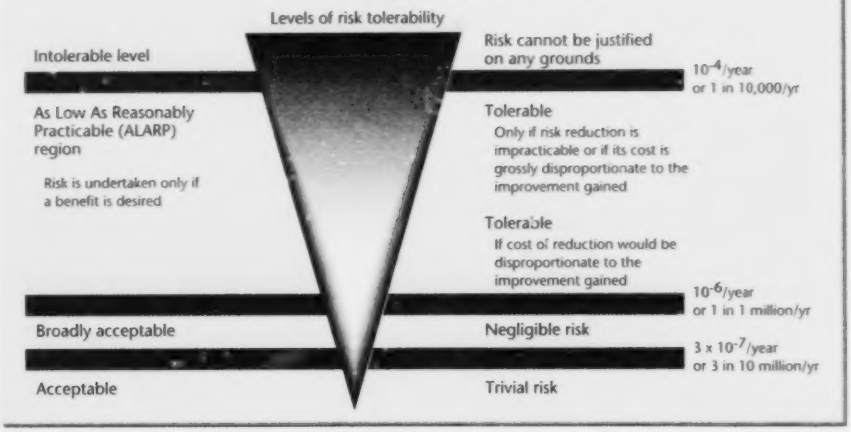
People have been attempting to forecast and minimize disaster from earliest times. There has long been a realization that not everything can be avoided. As the fifth century Greek poet Pindaros said: "Blind are the thoughts we cast to the future. Against all the odds, innumerable things will happen." Scientists involved in risk assessment would agree with him. More prosaically, they tell us there is no such thing as "zero risk". But even if there is no such thing as 100 per cent safety, a fuller understanding of the risks associated with any project can help us avoid accidents, which is effective **prevention**, and help us plan our response to those which may nevertheless occur, which is effective **preparedness**. ◆

Table 2
Some recent industrial accidents

Year	Place	Plant Type	Substances	Description
1996	San Juan Ixhatepec (Mexico)	Fuel depot	Hydrocarbons	Fire and explosion: Petrol leaking from a valve on a 1300 m³ storage tank caught fire, causing the tank to explode. Fire then spread to the rest of the depot. Four people died and 16 were injured. In all, the Red Cross tended to 950 people and 10,000 were evacuated. It took two days to bring the fire under control.
1996	Bombay (India)	Bulk terminal	Sulphur	Fire: A major fire at Jawaharlal Nehru Port started when sulphur on a conveyor belt caught fire. Bulk handling, including the handling of food grain imports, was seriously affected.
1996	Bulgaria	Refinery	LPG	Fire: On a weekend, fire broke out in a refinery near a port installation. Three employees died and nine others suffered severe burns. The suspected cause was a leak on a defective liquid petroleum gas (LPG) line.
1997	Memmingen (Germany)	Chemical factory	Poisonous gas	Fire: A factory fire sent clouds of gas thought to contain traces of cyanide and ammonia over the town centre. Residents were warned to keep doors and windows shut. Arson is suspected.
1997	Houston (USA)	Refinery	Hydrocarbons	Fire: Some 6000 residents were reported affected by a fire at the Deer Park Refinery near Houston, Texas. Benzene, propylene and other light ends were consumed in the fire. Benzene is carcinogenic, and releases of more than 4.5 kilos are reportable under US government statutes.
1997	Khabarovsk (Russia)	Chemical factory	Chlorine	Explosion: A chlorine tank exploded during welding and set the factory alight. Firefighting water mixed with chlorine gas, and one person was killed by the toxic cloud. 200 people were hospitalized, eight in critical condition.
1997	La Madeleine (France)	Chemical factory	Toluene	Explosion: 7 litres of a mixture of nitric acid and mononitrotoluene which had built up in a pipe exploded. The accident occurred because of inadequate maintenance of a flow meter, which had gone unnoticed.
1997	Dollard (Canada)	Pipeline	Oil	Spill: Over 35,000 litres leaked from a damaged pipeline in one night.
1997	India	Refinery	——	Explosion: An explosion killed 18 people and required the evacuation of 15,000. Many were injured, including 31 employees. The fire raged through the nearby port installations.
1997	Turkey	Wholesalers	Aerosols	Explosion: After an electrical failure in an aerosol packing plant, the return of the electricity supply caused a spark which set off an explosion in a batch of aerosol cans. Failure to react appropriately led to fire and BLEVE.

Source: *Hazardous Cargo Bulletin*, BARPI and UNEP consultants.

Figure 2
The ALARP triangle (as used in the UK)


Levels of risk tolerability
Intolerable level
Risk cannot be justified on any grounds
10-4/year or 1 in 10,000/yr
As Low As Reasonably Practicable (ALARP) region
Risk is undertaken only if a benefit is desired
Tolerable
Only if risk reduction is impracticable or if its cost is grossly disproportionate to the improvement gained
Tolerable
If cost of reduction would be disproportionate to the improvement gained
10-6/year or 1 in 1 million/yr
Broadly acceptable
Negligible risk
3 x 10-7/year or 3 in 10 million/yr
Acceptable
Trivial risk

A US perspective on chemical accident prevention, risk management and inherent safety

Jim Makris, Director, Chemical Emergency Preparedness and Prevention Office, United States Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460, USA

Abstract

The article highlights the major accomplishments of the United States in the area of chemical accident prevention in recent years, including passage of legislation aimed at halting accidental releases of hazardous substances. A strong partnership with our global neighbours, industry, and state and local governments has eased the burden of regulatory implementation. Future activities in this area are also discussed.

Résumé

L'article présente les dernières avancées majeures des Etats-Unis dans le domaine de la prévention des accidents impliquant des produits chimiques, notamment l'adoption d'une législation visant à mettre fin aux déversements accidentels de substances dangereuses. La mise en oeuvre de cette législation a été facilitée par un partenariat solide avec les pays voisins, l'industrie, les pouvoirs publics et les collectivités locales. L'auteur évoque également les activités futures prévues dans ce domaine.

Resumen

El artículo subraya los principales logros de los Estados Unidos en el ámbito de la prevención de accidentes químicos estos últimos años, incluso la aprobación de una legislación dirigida a suprimir las emanaciones de substancias peligrosas causantes de accidentes. Gracias a una sólida asociación con nuestros vecinos en el mundo, con la industria y las autoridades locales y estatales se ha podido aligerar el peso de la puesta en práctica reglamentaria. También se están tratando más actividades en este campo.

The United States is not alone in grappling with the issue of how to prevent accidental chemical releases. For the past decade, the world has seen a proliferation of chemical accidents. Several international organisations, including the United Nations Environment Programme (UNEP)and the Organisation for Economic Co-operation and Development (OECD), have done ground-breaking work to prevent chemical accidents from occurring. Many of those efforts are now reaching the point of fruition.

UNEP created the Awareness and Preparedness for Emergencies at the Local Level (APELL) Programme, which gave community right-to-know an international flavour and promoted the idea that keeping the public informed, getting the public involved, and dealing with issues surrounding risk to the community and the environment are best handled at the local level. OECD also issued guiding principles on accident preparedness and prevention, while the Earth Summit and the European Union's implementation of the Seveso Directive helped nations make collaborative strides to stem what seemed like a rash of chemical incidents.

The United States has actively participated in the development of these programmes and has taken part in seminars throughout the world to help newly emerging democracies and recently industrialized nations improve safety.

The United States Environmental Protection Agency has taken a leading role in building programmes for response to, preparedness for, and prevention of chemical accidents. EPA's activities in these areas come together in its Chemical Emergency Preparedness and Prevention Office (CEPPO), organized in 1985. Within CEPPO, the accident prevention programme addresses both regulatory and voluntary approaches to chemical safety.

Nations around the globe have discovered that we are all in this together – chemical accidents are an international concern, and every country faces the awesome responsibility of communicating that risk to the public.

Where are we now?

The United States Congress took note of the excellent work that was being done abroad in the area of chemical accident prevention. Legislation was drafted, and in 1990 Congress passed the Clean Air Act Amendments. The amendments were largely based on a prescriptive "Washington knows best premise" – command and control. A new mandate for industry, the Risk Management Programme (RMP), was buried in this massive piece of legislation. The RMP was an outgrowth of the Emergency Planning and Community Right-to-Know Act (EPCRA) and its revolutionary community right-to-know premise.

US EPA's Chemical Emergency Preparedness and Prevention Office faced a challenge when we sat down to write the rules for this new law – we knew we needed to shift away from the command and control approach of the past and move towards a more flexible "community/industry knows best premise".

To accomplish that goal, we:

- shifted to a performance-based method of compliance;
- focused on state/local/industry implementation;
- rejected a "one-size-fits-all" approach for industry and states;
- required the RMPs to be submitted in electronic format in a national repository;
- emphasized non-duplication of other federal laws;
- provided tools to help industry comply; and
- forged a net benefit regulation – the benefits outweigh the costs.

In writing the regulations, we also knew that the lines of communication with our stakeholders had to remain open, even after the regulations were issued. Because we knew the complexity of the data required under the rule, we wanted to avoid some of the data management problems that occurred after passage of the Emergency Planning and Community Right-to-Know Act.

In the early days of the community right-to-know law, local governments had little data management capability. When EPCRA chemical inventory data poured in to local emergency planning offices and became publicly available, there was little time to analyse and use the chemical inventories because the groups were unprepared for the vast amount of data they received from industry. Organizing the amount of paper they received, including Material Safety Data Sheets and chemical inventory reports, was extremely burdensome.

Who will report?

Under the new Clean Air Act amendments, an estimated 66,000 facilities that use regulated substances in quantities above threshold limits now must develop risk management plans. The facility risk management programme must include: a hazard assessment; an off-site consequence analy-

sis, including worst-case scenarios; a five-year accident history; an accidental release prevention programme; and an emergency response programme. The Risk Management Programme will be summarized in a Risk Management Plan that will be submitted and publicly available electronically.

The rule applies to facilities (both public and private) that manufacture, process, use, store or handle regulated substances at or above specified threshold limits that range from 500 to 20,000 pounds.

The first round of Risk Management Plans (RMPs) are due on 21 June 1999. Manufacturers are the prime target of the legislation, but cold-storage facilities that use ammonia as a refrigerant, public drinking water and wastewater treatment systems that use chlorine, propane distributors, and many other small to mid-sized businesses are covered under the new regulations.

The risk management plans will be helpful to state and local government agencies that are responsible for chemical emergency preparedness and prevention in enhancing existing emergency response plans. The information also will be useful to environmental and community organisations, the news media, and the public in order to understand more about the chemical risks in their communities and reduce risks.

Data dissemination

This time EPA wants to be sure the RMP data will be used by local emergency planners and the public immediately. And while the data required under the Air Act differs from information submitted under the Community Right-to-Know Law, we envision that RMP data will complement the emergency planning information already in the hands of the local groups.

To accomplish its goal of instant data dissemination, EPA established a workgroup to recommend how electronic submission of risk management plans could be accomplished and how the public could best access the RMP data. The workgroup consisted of more than 30 representatives from federal, state and local governments, environmental groups, industry, and the public. A final report given to EPA in June 1997 recommended providing on-line access to the RMP data via the Internet.

The information in the risk management plans will describe what risks are posed to the community by the chemicals that facilities are using. The plans also will describe what facilities are doing to lower those risks. If the risk management planning information is added to the information submitted under the Emergency Planning and Community Right-to-Know Act, and then is available to the public, it becomes a powerful tool to reshape chemical safety in communities. Around the country local groups will synthesize this information and apply it in a relevant, constructive way. When local planners and industry and members of the community are working together towards greater chemical safety, that is when EPA's philosophy really takes root: local risk, local action, local benefit.

The availability of this data will stimulate a dialogue between industry and the public to improve accident prevention and emergency response practices at the local level, and hopefully will be a precursor to a world-wide database that gives ready access to accident prevention information.

More than a requirement

For industry, chemical accident prevention has become more than just a regulatory requirement. More and more plant managers, whether they are subject to the risk management planning regulations or not, recognize chemical safety management as an integral part of running an efficient operation. At the same time, the new regulations have ensured that the public can be properly informed about chemical risks in their neighbourhoods. Likewise, community organizations, states, and the federal government all have become active players in helping to lower these risks.

While the approach is still so new that there is not yet any statistical analysis showing its application or effect, chemical accident prevention has spontaneously become the accepted way of managing chemical risk, since its immediate benefits are obvious and the potential for its long-term results is undisputed.

Progressive businesses in partnership with government through voluntary programmes are proving that prevention helps manage chemical risk, and the long-term results of these voluntary programmes are expected to be beneficial. Industry groups, such as the Chemical Manufacturers Association, have endorsed this concept through a Responsible Care programme. CMA established the Responsible Care programme to improve industry management of chemicals. The association requires its members to follow a set of principles for environmental, safety and health responsibility. While this programme supports EPA's continued effort to improve public safety and health, the agency would like to see the information be publicly available.

Chemical accident prevention is the best tool a company can use to fight accidents. As a tool, it can help a company identify potential risks and establish an organized method to reduce those risks. It's just a way of doing good business! It's a way of thinking, a way of looking at a set of conditions, and a way of making decisions – an integrated corporate philosophy that considers a company's entire operation, not just a piece of it.

Inherent safety – key issue

Inherent safety or primary accident prevention activities reduce or eliminate the possibility of an accident occurring through the fundamental redesign of production systems or products, reductions in chemical inventories, or substitution of less hazardous chemicals at the facility. Chemical plants have inherent risk if they are handling hazardous substances. The question is, how do you lower that risk?

There were powerful advocates who argued that there should be inherent safety requirements in the risk management planning rule, but EPA did not agree. Such specific requirements were unnecessary, since EPA believed inherent safety is indeed found in good chemical process safety management. Studies conducted by EPA have found that technology alone will not prevent a chemical accident. And, requiring specific technologies at chemical plants would have been in direct conflict with a performance-based approach to RMP regulation.

While the search for new, safer technologies is critical, there is a need to justify their viability and to decide whether there is an unintended transfer of risk. The greatest benefits more likely will occur for new processes rather than existing ones, although companies still need to work aggressively towards more inherently safe existing processes through process safety management. When new technologies become available and publicized, companies will need a good reason why those technologies were not selected under the Air Act's General Duty clause if there is an accident.

New technological development is an evolutionary process. But who decides if processes are safer today than in the past? EPA believes that sharing information found in the RMPs will raise the bar for all industry; information will drive the development of inherently safer approaches. If this does not happen, demands from the public will push government and industry to make it so.

Lessons learned

How does the experience of the United States in its efforts to prevent chemical accidents translate to nations undergoing new or renewed industrialization? There are a number of lessons that our country has learned and can share with others.

- **Vigilance** – A chemical accident only takes an instant to happen. This puts the burden of responsibility for vigilance at the source of the potential accident – the facility. But, realistically, a plant manager cannot inspect a facility's process systems every minute of the day. Chemical accident prevention starts at the top of the management chain. Through openness, management must communicate a commitment to safety down the ladder to every worker, so that each person feels a responsibility to report and address any unsafe condition.
- **Sharing information** – There are "too few" major chemical accidents in the world for any one country to develop a meaningful database on accidents. Everyone must share what they know – internationally – about the causes of accidents that have happened or "near misses" and how to keep them from recurring. Though prevention encompasses complex problems, the line must be drawn at reinventing the wheel. Openness about research, pilot programmes, and new technologies or practices will minimize redundancy and guarantee productive work for all nations.
- **Evaluation** – Ultimately, the goal is to reduce the number of accidental chemical releases that could endanger human life or the environment. But it is impossible to measure accidents that did not happen. Instead, surrogate indicators need to be established to measure the degree of our success: reduction in number of injuries or deaths; reduced volumes of chemicals handled or stored at facilities; substitution of chemicals in industrial

processes; changes in process design and equipment; and implementation of or improvement in management practices such as hazard evaluations, inspections and preventive maintenance, and worker training.

◆ **Management systems** – A combination of good process safety management and the development of a safety culture within industry in close coordination with the community is the key to success. This approach integrates management systems, process design and technology, operations, maintenance, workforce training, detection, and mitigation and response into a comprehensive effort. EPA views process safety management as a continuum that includes all elements of accident prevention. Industry has done its part with the Responsible Care programme. However, information gathered under such programmes should be available to the public.

◆ **Mitigation** – Applying the best possible technology and management practices will help prevent accidents occurring at their source. Mitigation also means effective and efficient monitoring, as well as notification systems and procedures to alert the public of a release.

◆ **Resources** – Unfortunately, chemical accident prevention never receives enough funding. Everyone needs to encourage their respective governments to do a better job of funding accident prevention programmes. A single chemical incident can cost millions of dollars to respond to, clean up, and investigate and would be a major setback for a newly-industrialised nation.

The road ahead

EPA is working through many issues to ease compliance for industry and states and to make more information available to the public:

◆ **Model RMPs** – Model programmes and plans for ammonia refrigeration, propane operations, drinking water plants, oil refineries, and batch chemical processing are almost complete. We are working with industry groups on other models for pulp and paper, warehousing, chlorine distribution, and packaging.

◆ **Questions and answers** – EPA staff has compiled a series of the most frequently asked questions regarding RMP compliance and offers answers to those questions on CEPPO's homepage on the Internet. Visit our site at: **http://www.epa.gov/swercepp/** to find out more about chemical accident preparedness and prevention.

◆ **Electronic data submission** – Work is underway on an electronic submission database for risk management planning data that could serve as a model database for the world. The access system (named "RMP*Info") would make nearly all the management planning data available on the Internet.

◆ **General duty** – The Air Act's general duty clause specifies that facilities that use hazardous chemicals are responsible for designing and maintaining a safe plant, identifying hazards, and minimizing the consequences of accidental chemical releases. But safe management of chemicals does not stop at the fence line; it has to involve the community around it. EPA is developing policies and guidance to use the general duty clause as a proactive prevention tool with strong enforcement available if needed.

◆ **Accident investigation** – EPA and the US Occupational Safety and Health Administration (OSHA) will be conducting joint investigations of major chemical accidents to determine probable root causes and make recommendations to enhance chemical safety. A Memorandum of Understanding has been reached on this coordination, and work is nearly done on a joint protocol for on-site investigations. The Wharton School of Business at the University of Pennsylvania and the National Institute for Chemical Studies in Charleston, West Virginia, are working with EPA and OSHA to explore how to improve the accident investigation programme. One thing is clear: it would be easier to determine root causes and share information if it were not for legal liability concerns.

◆ **ISO 14001 study** – EPA is sponsoring a pilot study to determine whether it is feasible to develop an ISO 14001 option that would enhance implementation of the accident prevention rule and that would be acceptable to industry, the public and states. It is expected that such an option would be attractive primarily to larger facilities and some moderate-sized companies. Under the pilot study, ISO 14001 certified firms would adopt RMP requirements and would use these objectives as a benchmark for the annual ISO audit of their performance. Additionally, companies would agree to quickly correct deficiencies uncovered during the audit and would hold public meetings to discuss audit findings.

The proposal should provide incentives to all three stakeholders: it would allow the regulated facility more flexibility to design a compliance programme tailored to its own needs with a minimum of formal oversight; it should result in better relations between the facility and the local community; and it would give states the option to implement strategies that would allow resources to be focused on regulated facilities that are more likely to be out of compliance. Lastly, local communities would be assured that this information and compliance with the RMP rule have been reviewed by an independent party.

Summary

Managing chemicals safely is the responsibility of everyone – industry, workers, governments at all levels, trade associations and professional societies, environmental groups, insurance companies and financial institutions, colleges and universities, international organizations, fire services and emergency response personnel, public health officials and medical practitioners, the news media, and local communities.

Facilities are taking steps to find out more about how to prepare their risk management plans given public awareness, new standards and regulations which have already been issued, and the approaching 21 June 1999 deadline for submittal. The RMP approach to managing chemicals safely and to preventing accidents from happening is here to stay.

The philosophy and techniques of chemical accident prevention offer all of us a great opportunity to reduce the number and the severity of accidental chemical releases. EPA's policies, procedures and practices are intended to guarantee that barriers to major accidents are in place, as well as in use. As an approach to risk reduction, maintaining a safe business operation encompasses safe practices, product stewardship, informing the public, and much more. What it really means is that people in the business of making, storing or handling hazardous chemicals must recognize that safety is not at the bottom of their list of responsibilities. It is at the top. ◆

CHEMTREC®: the CMA's Chemical Transportation Emergency Center

Henry J. Sauer, Managing Director, CHEMTREC Information Services, Chemical Manufacturers Association, 1300 Wilson Boulevard, Arlington, Virginia, USA

Abstract

CHEMTREC®, the Chemical Transportation Emergency Center established in 1971 by the Chemical Manufacturers Association (CMA), is a private industry/government partnership providing fire fighters, law enforcement agencies, government bodies and others with information and advice necessary to mitigate emergencies associated with the transportation of hazardous materials. This voluntary public service has expanded under CMA's Responsible Care® programme to provide a public communications link to information on environmental, health and chemical safety. CMA is committed to facilitating the growth of this partnership network of allied associations, government agencies, chemical carriers, and others in order to be the most effective chemical information service in the world.

Résumé

CHEMTREC® est un centre d'intervention d'urgence spécialisé dans les accidents de transport de produits chimiques, créé en 1971 par l'Association américaine des fabricants de produits chimiques (CMA) sous forme de partenariat entre industrie et pouvoirs publics. CHEMTREC fournit aux brigades de pompiers, aux organismes chargés du respect de la loi, aux administrations publiques et autres organismes des informations et des conseils pour mieux maîtriser les situations d'urgence liées au transport des matières dangereuses. Ce service totalement volontaire a été mis en place dans le cadre du programme Responsible Care® de la CMA pour donner accès aux informations sur la protection de l'environnement et de la santé, et sur la prévention des risques chimiques. La CMA a pour ambition de faciliter l'expansion de ce réseau d'associations, d'administrations publiques, de transporteurs de produits chimiques, etc... pour en faire le service d'information sur les produits chimiques le plus efficace du monde.

Resumen

CHEMTREC, el Centro de Emergencias de Transportes Químicos establecido en 1971 por la Asociación de Fabricantes Químicos (CMA), es una asociación entre la industria privada y el gobierno a efectos de proporcionar a los bomberos, las autoridades responsables de aplicar la legislación, los órganos rectores y otros entes, la información y el asesoramiento necesarios para mitigar las emergencias relacionadas con el transporte de materiales peligrosos. Este servicio público voluntario se ha ampliado bajo el programa "Responsible Care" de la CMA con el objeto de suministrar un vehículo de comunicaciones públicas para la información sobre la seguridad medioambiental, sanitaria y química. CMA se ha comprometido en propiciar el crecimiento de esta red de mutua colaboración entre asociaciones aliadas, agencias gubernamentales, transportadores químicos y otros a efectos de lograr ser el servicio de información en materia química más eficiente en el mundo.

CHEMTREC® is the **C**hemical **T**ransportation **E**mergency **C**enter. It has been a public service of the Chemical Manufacturers Association (CMA) since 1971. CHEMTREC's mission is to provide chemical-specific information to emergency services. It is available 24 hours a day, every day, through a toll-free telephone number, (1) (800) 424 9300, accessible in the United States and Canada, and through collect telephone calls to US telephone number (1) (703) 527 3887 from other locations outside the US.

CHEMTREC has achieved a great deal during 25 years (see **Figure 1**). It recently received its two millionth telephone call and processed its five millionth Material Safety Data Sheet (MSDS) for emergency communications service use. CHEMTREC has achieved this level of public service because it is an important resource for chemical information and emergency response assistance.

Transportation safety is one of CMA's roots. In 1872 a group of 15 sulphuric acid manufacturers formed the Association, in part to take action to improve the safety of the transportation of this basic chemical. CMA developed labelling and packaging specifications and published Safety Data Sheets for many major chemicals. Other chemical safety information programmes followed.

CHEMTREC began operations in September 1971, after the US Department of Transportation (DOT) urged CMA to establish a chemical transportation emergency communications centre for emergency responders. In 1980, CMA formalized this unique partnership between industry and government when it signed a Statement of Formal Recognition and Attendant Understandings with the DOT. The CHEMTREC Center operates instead of a Congressionally mandated, government-run operation.

The CMA-DOT commitment includes a requirement for close cooperation between CHEMTREC and the US National Response Center (NRC), including improvements in communications capabilities and work towards long-term goals relating to hazardous materials incidents and emergency response. The NRC operates at the US Coast Guard Headquarters in Washington, D.C. It is the operations and communications centre for the National Response Team, a planning, policy and coordinating organization involving 14 US government agencies. The NRC is also the operational link between the local "Federal On-Scene Coordinator" and the National and Regional Response Teams involved with all types of disasters.

The NRC began operations in 1974 primarily to receive the required reports of oil spills regulated by the Federal Water Pollution Control Act of 1973. Its role has expanded to acting as the sole point of contact for required reporting of oil, chemical, radiological and biological discharges. The NRC recorded 29,229 hazardous materials releases in 1996. About 40 per cent of these reports involved fixed facilities. Historic data and more detailed information, including lessons learned from case studies, are available on the NRC web page: **www.dot.gov/dotinfo/uscg/hq/nrc/incident.htm.**

Reporting to CHEMTREC is voluntary, and CHEMTREC receives very few calls involving gasoline, diesel and other oil spills. Most basic chemical producers require their carriers to report all incidents to CHEMTREC in addition to the NRC. CHEMTREC recorded 10,597 incidents during the twelve-month period ending 31 May 1997. There were 7598 transport-related incidents. The other reported incidents either involved human exposures (1350 cases) or were not transportation-related (1649 cases).

Figure 2 shows the sources of emergency calls to CHEMTREC. The primary transportation modes involved are terminals (57 per cent), highways (26 per cent) and rail traffic (15 per cent; **Figure 3**). Twenty-three per cent of the rail incidents were car derailments with no reported loss of materials. Most reported incidents are relatively minor, involving the release of less than 100 pounds of materials. **Figure 4** shows the percentage of reported incidents by container type.

CMA members, representing 90 per cent of the production capacity for basic chemicals in the US, established the CHEMTREC Center for the

emergency services. The original operations policy regarding non-emergency callers was to be polite, but to get these callers off the line. Today CHEMTREC serves all those who have emergencies or health and safety concerns regarding chemicals. The order of the day is now to make the best efforts to help every caller, every time. Figure 5 shows the sources of non-emergency calls.

CMA recognized that public service value is greatly enhanced by CHEMTREC non-emergency information services. The non-emergency call centre was established in 1985. One of its key objectives is to make emergency services and others aware that you do not have to have an emergency in order to get information on chemicals. Of course, the time to obtain information on dangerous goods is long before an emergency occurs. The non-emergency centre is successful. It receives more calls from the fire service, law enforcement, and medical professions than from those calling to deal with emergencies involving chemicals. Over 80 per cent of calls to CHEMTREC do not involve chemical emergencies.

After the DOT implemented the Hazardous Materials Communications Standard in 1990, the demand for CHEMTREC communications services increased dramatically. This regulation requires all shippers of hazardous materials to include an emergency telephone number on shipping papers. The emergency responder's access to emergency information has thus been vastly improved. Specific and more current information is now available on many more products. Nearly 70,000 new MSDSs are added each month. CHEMTREC has thousands of new company contacts, which can provide emergency information that may not appear on labels or in other published product information, because of this government action.

The CHEMTREC emergency communications network reaches far beyond the basic chemical industry. It includes businesses in virtually every sector of the economy and many companies that trade internationally. Hazardous material shippers in the CHEMTREC network are also able to activate CHEMNET®, the chemical emergency response mutual aid network. In 1985, CMA implemented this mutual assistance programme to provide timely emergency response and technical advice at the scene of an emergency. CHEMNET involves contracted arrangements between major producers which have agreed to assist each other in responding to emergencies. The network includes for-hire contractors. Shippers may activate CHEMNET through CHEMTREC; those companies which cannot provide emergency response staff for off-site incidents may participate in the programme through access to the for-hire contractors. CHEMNET is a contingency plan to support local response capability. CHEMTREC recorded over 10,000 incidents this past year, but it activated CHEMNET only twice a month on average.

CHEMTREC can also activate other chemical-specific mutual assistance response groups whose functions may involve telephone instruction to personnel at the scene or assistance at the scene by personnel trained and equipped to do the job (see Figure 6). The most experienced group is the Chlorine Emergency Plan (CHLOREP), organized by the Chlorine Institute 25 years ago. It operates from 60 plant locations in the US and Canada and includes major chlorine distributors as well as producers. The Compressed Gas Association organized the Compressed Gas Emergency Plan (COMPGEAP) to help emergency responders deal with transportation incidents involving compressed gas products.

A group has also been organized to assist in emergencies involving swimming pool chemicals. There are mutual assistance groups for oleum, vinyl chloride, hydrogen peroxide, sulphur dioxide, cryogenic hydrogen chloride, hydrogen cyanide, phosphorus, methylamines, liquefied natural gas, and fireworks. CHEMTREC did not activate most of these mutual assistance groups during the past year.

Each year the emergency communications process becomes more efficient with the acquisition of improved technical resources and other enhancements to computer and telecommunications systems. However, the basic communications process for major shippers has not changed a great deal. For the majority of reported incidents it is basically a two-step process:

1. After obtaining available information from the caller, the CHEMTREC emergency service specialists provide technical information; and
2. CHEMTREC contacts the shippers to inform them of the incident.

Most shippers have additional resources, such as product specialists who can provide information that may not be on Material Safety Data Sheets or other readily available published resources in the CHEMTREC data base. Major shippers may be able to activate a mutual assistance response team. CHEMTREC contacts may include: carriers' headquarters, the Association of American Railroads Bureau of Fire and Explosives, a CHLOREP team, a basic producer of the product involved, or government agencies such as the National Response Centre. CANUTEC (for incidents or shipments originating in Canada),

Figure 1
CHEMTREC service activities, 1971 and 1996

1971 (first-year operations)	1996 (year 25)
• 5925 calls received	• 250,000 calls received
• 1798 emergency calls	• over 44,000 in & outbound calls received
• network of 107 shippers	• network of over 20,000 shippers
• 1700 chemical information cards	• 2 million Material Safety Data Sheets and other resources

Figure 2
Sources of emergency calls

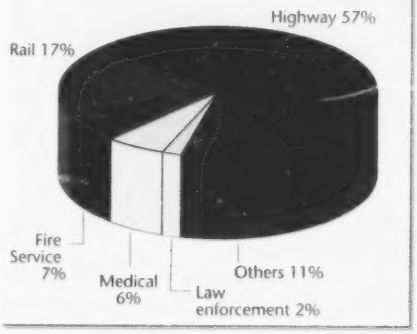


Figure 3
Rail incidents by type

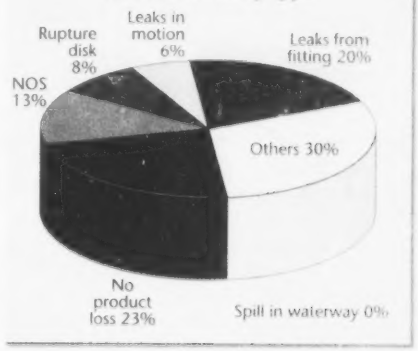


Figure 4
Incidents by container type

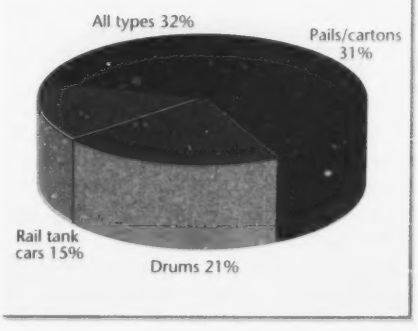
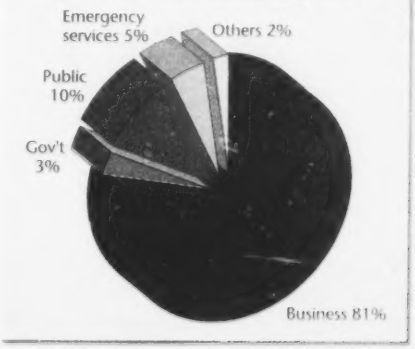


Figure 5
Sources of non-emergency calls



the US Agency for Toxic Substances and Disease Registry, or representatives with the US Department of Defense. These other resources are available on-line by teleconference with the on-scene commander.

The following incidents demonstrate how CHEMTREC functions. It communicates reports on the more significant incidents to the National Response Center.

• *Route 11B, Malone, Franklin County, New York* – At 4:44 p.m. the Franklin County Fire Department called to report a split tank truck containing napthalene at Route 11B, Malone, New York. The shipment came from Napaville, Quebec, Canada. CHEMTREC provided basic information and a Material Safety Data Sheet on the product via fax. CHEMTREC called CANUTEC (the Canadian Transportation Emergency Center) for shipper contact because the shipper was not registered with CHEMTREC. CANUTEC located the shipper's representative for teleconference with the on-scene incident commander. CHEMTREC also notified the carrier's headquarters to inform them of the incident.

• *Rural road, Midland County, Texas* – At 9:11 p.m. the Midland County Fire Department called regarding an abandoned pallet of bags of sodium dichromate. The bags, from the Chrome Chemical Co. of South Africa, were old and some were broken. CHEMTREC provided a Material Safety Data Sheet and contacted a basic producer in the United States. CHEMTREC connected the producer's representative with the fire department by teleconference.

• *Medical centre, Burlington, Iowa* – A medical centre nurse called regarding treatment recommendations for a patient exposed to 50 per cent caustic soda. The exposed area had been flushed with water immediately after exposure, but skin redness and discomfort persisted. CHEMTREC arranged a teleconference between the medical centre and the Bay Area Regional Poison Control Centre in San Francisco to discuss treatment protocol. The Poison Control Centre is under contract to CMA to provide medical consultations in the event shippers do not have this capability.

• *Hospital at Berkeley, California* – A hospital called for advice. They were treating a patient with liver and kidney failure. The patient had been spraying an automotive product in an enclosed space for several days. The hospital identified the product and called the manufacturer, which in turn told them to call CHEMTREC. (The company was a small manufacturer with key technical people away travelling.) The CHEMTREC Emergency Service Specialist contacted a CMA member company that was a basic producer of the chemical, and one of this company's physicians called the hospital to provide assistance.

• *Interstate Highway 59, Sheppard, Texas* – The Texas Department of Public Safety called to report

The ICE initiative: chemical transport safety in practice in Europe

Filip Jonckheere, Technical Affairs Department, CEFIC, avenue E. van Nieuwenhuyse 4, Bte 1, 1160 Brussels, Belgium

The International Chemical Environment (ICE) programme is a cooperative effort between European chemical companies to prevent chemical transport incidents and to respond effectively if and when they occur. The programme provides a vector for the chemical industry to make its expertise available to national emergency authorities.

ICE was started in May 1990 by a small group of chemical companies. Since then it has grown as the need for such cooperation was increasingly recognized. In November 1991, ICE became an official activity of the European Chemical Industry Council (CEFIC), which represents the whole of the chemical industry in Europe.

ICE has objectives in two areas: emergency response and prevention. Where emergency response is concerned, the aim is to provide assistance to the emergency authorities dealing with chemical transport accidents, via a network of national centres and mutual assistance schemes between chemical companies. In the area of prevention, ICE aims to reduce the risk of transport accidents by developing Safety and Quality Assessment Systems (SQAS) and by having them applied periodically to providers of distribution services.

Emergency response

No one knows products better than their manufacturers, and this is the expert knowledge which the ICE programme makes available to the authorities dealing with accidents. The ultimate aim for ICE is to set up a national scheme in each European country. A national scheme is a formal protocol between the national chemical federation and the emergency authorities which specifies the framework for assistance from the industry when transport emergencies arise. The key element is a register of participating companies which commit themselves to providing assistance at specified levels, not only for their own products but also for those of other companies.

There are three levels of assistance:

- Level 1: general advice by telephone or fax;
- Level 2: expert(s) at the scene of the accident;
- Level 3: expert(s), equipment and specialist personnel at the scene of the accident.

Each participating country also has a national centre supported by the chemical industry. National centres are focal points which can be contacted by the emergency authorities 24 hours/day and which will provide initial telephone advice or endeavour to mobilize industry expert resources within the national scheme.

International cooperation is an important aspect of ICE, as more than 60 per cent of the chemicals transported in Europe cross national boundaries. To overcome potential communication problems arising from the fact that 20 languages are spoken in Europe, all of the national centres are able to communicate in English.

The ICE network currently extends to 12 countries (see table) and has the commitment of over 600 individual chemical plants. Over 1000 interventions per year are currently being handled.

Links with other emergency centres

Although ICE is mainly geared to land-based transport, formal contacts have been established with two internationally recognized centres with maritime emergency response expertise:

- REMPEC (Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea) in Malta, set up by the Mediterranean coastal states with the support of IMO and UNEP.
- CEDRE (Centre for Documentation, Research and Experimentation concerning Accidental Water Pollution), set up in Brest (Brittany, France) in the aftermath of the *Amoco Cadiz* accident in 1978.

Prevention

The objective of the prevention part of ICE is to minimize the possibility of accidents occurring. Since most chemical distribution activities are subcontracted, there is a need for uniform safety and quality criteria against which distribution companies can be regularly assessed. The European chemical industry saw a number of reasons for initiating a Safety and Quality Assessment System (SQAS) to provide objective indicators of continuous improvement:

- Compliance with regulations, although required, does not of itself ensure safe distribution of chemicals.
- Standards like the International Organization for Standardization's ISO 9002 do not cover safety issues adequately. Furthermore, certification is a pass or fail activity, which makes it difficult to measure any improvement a company might

that a tank truck with triethylene glycol had rolled over on a passenger vehicle. The truck was leaking. CHEMTREC notified the shipper, which dispatched a response team to transfer the chemical. CHEMTREC connected the shipper, carrier and people on the scene by teleconference in order to coordinate actions.

• *Los Angeles Airport, California* – An air freight dispatcher called to report a cargo container leaking "cytomegalo virus". CHEMTREC, which had no information on this specific material, set up a teleconference with the US Center for Disease Control in Atlanta, the airline representative, and the Federal Aviation Administration representative in Los Angeles to discuss recommendations for dealing with this situation.

• *Imperial Valley, California* – The Imperial Valley Fire Department's Hazardous Materials Team called to request personnel protective equipment recommendations for disposal of several open buckets of hydrogen iodide (hydriodic acid). They had obtained this material from an illegal drug lab. CHEMTREC arranged a teleconference with a basic chemical producer which provided advice.

• *Arroyo Grande, California* – At 8:16 a.m. the chief of the local fire department called to report a damaged, overturned tank truck leaking both gasoline and diesel fuel from the dome area. He requested shipper contact to discuss materials transfer from the damaged trailer. CHEMTREC contacted the shipper, who initiated a response from a local transportation terminal.

• *Chemical storage facility, Texas* – At 7:21 p.m. a caller reported damage to three 1000-gallon storage tanks due to a tornado in the vicinity. One tank was leaking hydrochloric acid. The assistance of a response team was requested. CHEMTREC coordinated action with the shipper and notified the nearest response team at 7:27 p.m. CHEMTREC also sent MSDSs to the incident scene. At 11:18 p.m. the response team contact called to report that the situation was under control.

• *Truck stop, Ohio* – At 1:28 p.m. a truck driver called to report that he had two 55-gallon drums of hydrofluoric acid that had fallen over and were leaking. He had been exposed to the product when he attempted to upright the drums and was experiencing a "burning" sensation on his face and arms. CHEMTREC informed the caller of the hazardous nature of the material and the urgent need for immediate medical attention. He was recommended to call 911 for local emergency response. CHEMTREC also called the shipper to inform it of the situation and provided incident details for follow-up action.

• *Highway in Alabama* – At 2:48 a.m. a caller reported an overturned truck with the driver injured and trapped in the vehicle. Smoke was present, but the caller was not sure whether it was due to leaking product. The truck was carrying hydrofluoric acid. The fire department on the scene, which did not have protective equipment, re-

have made since certification or to distinguish between two certified companies.

♦ Transport companies were confronted with a myriad of inspections by individual chemical companies using similar but different questionnaires.

The chemical and transport industries therefore developed a common questionnaire, and corresponding guidance notes. The questions, which require a "yes" or "no" answer, cover quality, safety and environment. They are categorized into statutory requirements, industry norms, and areas for future development. Questions also place particular emphasis on the management system of the company being assessed.

With this system, providers of distribution services are subject to a single assessment by a qualified third party. The assessment does not provide certification, but the factual results offer the individual chemical company an objective tool to evaluate the performance of a distribution service provider according to its own specific requirements.

The SQAS schemes for road and maritime transport are operational, and schemes for other modes of transport are under development. The current status is as follows:

SQAS Road

The assessment is carried out, at the haulier's request, by qualified assessors from certification bodies engaged in ISO 9002 certification. Since the scheme was launched in 1995, over 300 assessments have taken place in 11 different countries and involving 15 different certification bodies.

The results of the assessment are not stored in a central database, but can be requested by each chemical company from the haulier for further evaluation. The questionnaire and corresponding guidance notes are freely available in seven different languages.

Country	National scheme	National centre	No. of companies
Austria	TUIS	BASF – Ludwigshafen	28
Czech Republic	TRINS	Chemopetrol – Litvinov	10
Denmark	FDKI RvK	Emergency Agency – Copenhagen	19
Finland	Finterc	Emergency Centre – Helsinki	37
France	Transaid	eight regional centres	160
Germany	TUIS	BASF – Ludwigshafen	155
Italy	SIET	Enichem – Porto Marghera	58
Netherlands	TRC	DCMR – Rotterdam	5
Spain (Catalonia)	ICECAT	Emergency Authorities – Barcelona	12
Sweden	ERC	Poison Centre – Stockholm	109
Switzerland	AC Schutz	Novartis – Basel	39
UK	Chemsafe	NCEC – Culham	40

SQAS Marine

The inspection scheme for chemical ships is administered by CDI (Chemical Distribution Institute), a foundation currently supported by 22 major chemical companies. Nearly 900 ship inspections have been completed so far, at a rate of 40 inspections per month and involving 180 ship operators and 26 CDI-accredited inspectors. The ship inspection data are electronically accessible to participants. In view of the global character of shipping, interest outside Europe is growing.

SQAS Bulk Storage Terminals

A technical and management questionnaire has been finalized and agreed with the major bulk storage companies. Assessment will be carried out by inspectors trained and accredited by a separate branch within CDI. The scheme is set to become operational in the first half of 1998.

Other SQAS developments

♦ **Tanker cleaning stations**: In cooperation with EFTCO (European Federation of Tanker Cleaning Organisations), a questionnaire has been developed for the assessment of road tanker cleaning stations.

♦ **Marine packed cargo**: Questionnaires are being developed to cover forwarding, container stuffing and stripping, port agencies, and terminal and shipping activities in the field of marine transport of packaged chemicals.

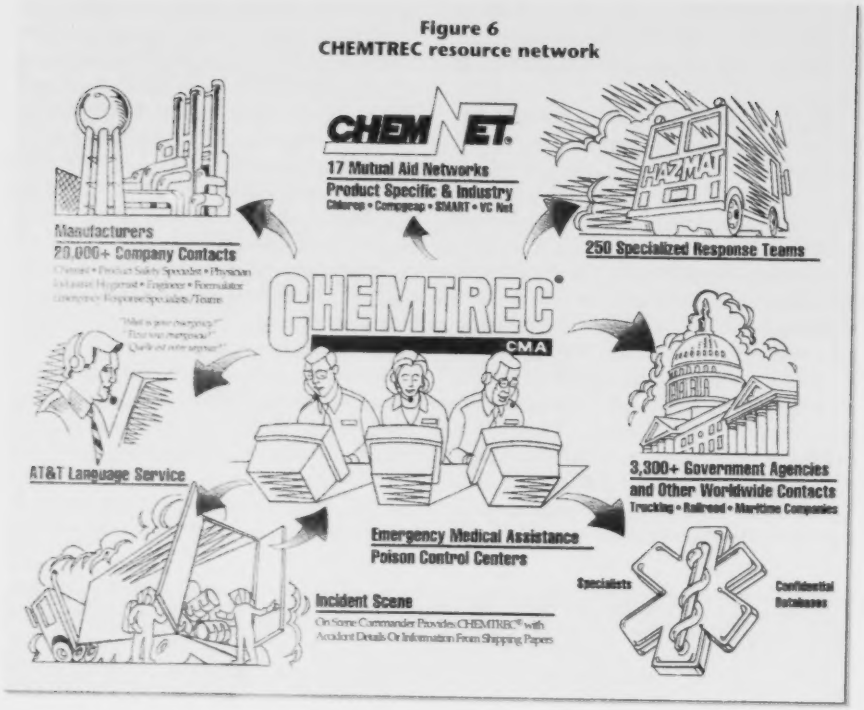
♦ **Inland waterways**: In cooperation with Concawe (the European oil companies' organisation) a questionnaire for the inspection of barges on the Rhine has been developed. Assessments, by qualified inspectors, will start in the second half of 1997.

♦ **Intermodal transport**: An ad hoc group is developing a questionnaire addressing the specific aspects of intermodal transport.

Although the existing schemes have not been operating long enough to produce precise statistics, there is already encouraging evidence that transport operating standards are improving.

Although the chemical industry has an excellent record on transport safety, the ICE programme will help the industry live up to the axiom of its Responsible Care initiative: "One incident is one too many."

Figure 6
CHEMTREC resource network



quested information on how to handle the driver when extracted from the vehicle. CHEMTREC provided information on the product, including decontamination procedures at the scene, guidelines for handling possible chemical exposure, and recommendations on protective equipment. CHEMTREC also notified the shipper and carrier. CHEMTREC dispatched a hazardous materials team to the scene.

• *College chemistry laboratory* – A caller reported that a college student who had been working with 2,4,6-tribormophenol in a biological experiment was being treated. The student suffered severe second-degree burns on the chest and arms when the container exploded and he was splashed with the product. A Material Safety Data Sheet was available. CHEMTREC contacted a physician and the manufacturer's corporate safety director, and connected the concerned parties by teleconference to discuss recommended treatment protocol.

• *Carrier's terminal dock, California* – A caller reported that a drum of "corrosive liquid, organic, N.O.S. rocketed 12 feet into the air after the bung blew off." The product had spilled onto the dock, resulting in strong odour and vapours. CHEMTREC provided information on dealing with this type of chemical hazard and contacted the shipper's product specialist to discuss clean-up procedures by [illegible]nce.

• *Rail line in Florida* – A caller reported a 17-car train derailment. Two tank cars of sodium hydroxide liquid were punctured and leaking. The local fire department evacuated 100 people living in the vicinity. CHEMTREC contacted the shipper representatives from several companies with hazardous materials that were involved. The appropriate shipper emergency contacts were connected with the safety officer at the scene to discuss recommendations for dealing with this situation.

• *Warehouse in Washington, D.C.* – A multiple-alarm fire broke out at a large warehouse with scrap tires. A hospital paramedic called for advice in treating fire fighters exposed to the smoke, who were experiencing breathing difficulties. CHEMTREC contacted the Agency for Toxic Substances and Disease Registry and a consulting physician and connected them with the hospital by teleconference to discuss patient treatment protocol. CHEMTREC also provided the on-scene commander with the US EPA regional contact and with published guidelines on scrap tire fire fighting.

• *Lagoon at Majuro, Republic of the Marshall Islands* – A caller reported a leaking 20-foot container known to be holding 21 cylinders of chlorine. The container was on a barge anchored in a lagoon. The barge had been evacuated. The caller was unfamiliar with the hazardous materials response capabilities of local authorities. CHEMTREC contacted the shipper's representative and the team leader of the CHLOREP mutual assistance network and connected the caller by teleconference. They discussed response options and product hazards. During the conference, the container stopped leaking. The US Coast Guard was notified, and the barge was moved to a nearby military base for inspection.

• *Norfolk, Virginia* – At 00:41 a.m. a caller reported that a damaged isotank had leaked about 1000 gallons of methyl formate. The caller requested product information for treating three workers transported to the hospital with inhalation exposure. CHEMTREC contacted the treating physician and provided the information. At 1:10 a.m. the US Coast Guard called requesting environmental effects information because the material had leaked into a storm sewer and the nearby river. CHEMTREC obtained the name of the shipper from the freight forwarder and then connected the shipper's representative by teleconference with the other parties to discuss recommended actions.

Focus for the future

The Chemical Manufacturers Association launched the Responsible Care® programme in 1988 to respond to public concerns about the manufacture and use of chemicals. CMA embarked upon the most ambitious and comprehensive effort ever attempted by American industry. The programme requires CMA member companies to support a continuing effort to improve the industry's responsible management of chemicals, and to do a better job of eliciting and responding to public concerns about products and operations. CHEMTREC is successful because CMA members perceive the CHEMTREC Center to be one of the greatest member values for meeting these obligations.

The Responsible Care Guiding Principles outline each CMA member company's commitment to environmental, health and safety responsibility in managing chemicals. CMA members pledge to manage their businesses according to these principles. Six Codes of Management Practices are at the heart of Responsible Care. They focus on management practices in specific areas of chemical manufacturing, transportation and use.

The CHEMTREC Center assists CMA member companies and Responsible Care Partners in meeting several commitments under Responsible Care – Codes of Management Practices for Distribution, Product Stewardship, and Community Awareness and Emergency Response.

1. **The Distribution Code** focuses on employee and public risks from the shipment of chemicals and applies to the transportation, storage, handling, transfer and repackaging of chemicals in transit.
2. **The Product Stewardship Code** focuses on the management of chemicals from initial research through manufacture, use, recycling and disposal.
3. **The Community Awareness and Emergency Response Code** focuses on promoting emergency response planning and improving dialog with chemical plant communities.

In addition to its emergency services functions, CHEMTREC helps members meet obligations under Responsible Care by facilitating access to non-emergency chemical product and chemical health, safety and environmental disposal information. The following vision statement defines the goals of the CHEMTREC Center's public service:

• *To be recognized by the emergency response community, government agencies, and by hazardous materials manufacturers, shippers and carriers, as the most effective chemical emergency information service in the world.*

• *To be recognized by the general public and community agencies as a nationwide, effective source to facilitate chemical product and chemical industry health, safety, environmental and disposal information exchange.*

The CHEMTREC Center is well positioned for the 21st century because it benefits greatly from the CMA members' strong commitment to Responsible Care. Efforts to increase public trust in the Responsible Care programme depend a great deal on the success of efforts to build strong working Responsible Care partnerships with allied trade associations, government agencies, chemical distributors, chemical carriers, and chemical trade associations worldwide. The members of these other organizations have a significant impact on how the public perceives chemical industry management practices. Therefore, the challenge will be to increase this Responsible Care network. It is very advantageous for these groups to encourage their members to participate in the CHEMTREC communications network.

Today the CHEMTREC network reaches far beyond the members of CMA and their subsidiary companies. CHEMTREC communications become more efficient as more shippers, carriers and other organizations become registered. CMA works hard to increase this network. Its efforts benefit the Responsible Care partnership programme because, for many organizations, CHEMTREC becomes their first association with CMA.

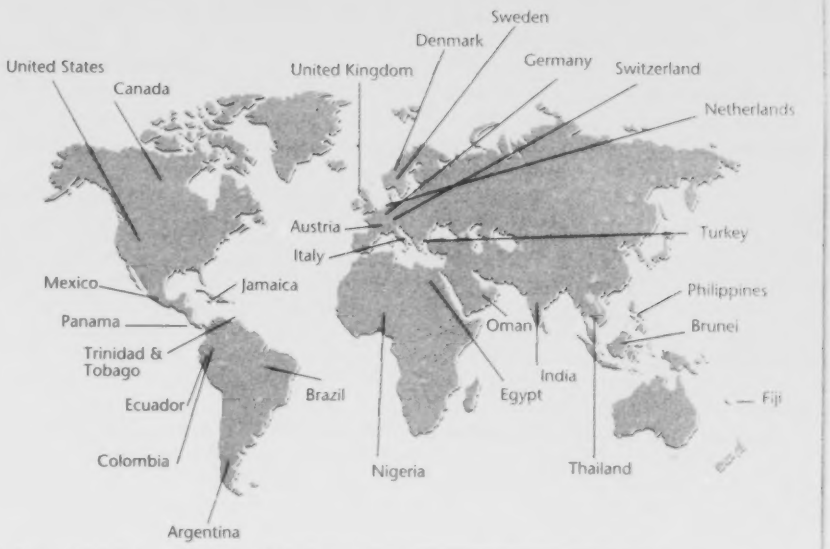
CHEMTREC customers will determine the scope of services for the year 2000 and beyond. CMA formed the CHEMTREC Advisory Panel under the following charter, to ensure that CMA initiates actions to continually improve services in order to meet the needs of customers:

The purpose of the CHEMTREC Advisory Panel is to provide continuous review of the CHEMTREC Center programmes and advise CMA of recommended changes in the operating policies and practices of the Center. The Advisory Panel will serve as a forum to discuss changes in the CHEMTREC Center programmes and the appropriate development of these programmes in coordination with the private industry, federal and local government emergency response capabilities. They will assist CMA in the formation and the periodic review of a long-range plan for the CHEMTREC Center.

CHEMTREC is committed to making the best use of technology to assist emergency responders, chemical carriers and shippers. The goal is to improve the availability of chemical information, and to work towards facilitating a worldwide network of transportation emergency centres that can rapidly share information as the need arises (Figure 7). CHEMTREC Center staff meet with many international visitors each year, and all are most welcome to visit CMA in Arlington, Virginia. Please visit CHEMTREC when you are in the Washington, D.C. area.

E-mail: hank_sauer@mail.cmahq.com ◆

Figure 7
Vision: worldwide network of chemical emergency centres



Pipeline emergency response in CEPA member companies

Canadian Energy Pipeline Association, 1650-801 6th Avenue South West, Calgary, Alberta, T2P 3W2, Canada

Abstract
CEPA member companies address pipeline integrity proactively through their design, construction and mitigation practices. This article discusses member company procedures in regard to leak and rupture detection, shutdown and isolation of failure sites, and emergency preparedness. Emergency response has evolved over the last decade from a purely technical function, carried out by pipeline personnel in the event of an emergency, towards a process that is well documented within companies and integrated with potentially affected communities.

Résumé
Préférant agir plutôt que réagir, les entreprises membres de la CEPA font de la prévention des risques associés aux pipelines un processus continu allant de la conception à la construction et à l'entretien des pipelines. L'article commente les pratiques adoptées pour la détection des fuites et des ruptures, la fermeture et l'isolement des sites défaillants, ainsi que la préparation aux situations d'urgence. En dix ans, les interventions d'urgence ont sensiblement évolué : autrefois considérées comme une fonction purement technique exécutée par des spécialistes des pipelines, elles sont devenues un processus bien documenté dans les entreprises et qui implique les populations exposées à des risques.

Resumen
Las compañías miembros de la CEPA se ocupan activamente de la integridad de los oleoductos mediante su diseño, construcción y prácticas de mitigación. Este artículo presenta los procedimientos de las compañías miembros respecto a la detección de pérdidas y roturas, cierre y aislación de sitios defectuosos y preparación para las emergencias. La respuesta en materia de emergencias ha evolucionado durante la última década, pasando de una función puramente técnica, ejecutada por el personal de los oleoductos en casos de emergencia, hacia un proceso bien documentado dentro de las empresas y relacionado con comunidades potencialmente afectadas.

Introduction

The Canadian Energy Pipeline Association (CEPA) represents the interests of the eleven major crude oil and natural gas transmission pipelines that transport over 95 per cent of the natural gas and oil produced in Canada. In 1996, this vital transportation link delivered over $30 billion of product to domestic and export markets. We directly employ over 9000 people and pay property taxes in excess of $250 million per year.

In 1995, the National Energy Board (NEB) launched a public inquiry into stress corrosion cracking (SCC). The NEB released its report on the inquiry in December 1996. It comprised 27 recommendations for managing SCC.

CEPA prepared a submission to the NEB, on behalf of its member companies, addressing all aspects of SCC. The submission included a description of CEPA member companies' emergency response practices. This submission is reproduced below.

CEPA member companies address pipeline integrity proactively through prudent design, construction and mitigation practices. They consider emergency response as a measure to be employed when a service incident does occur, regardless of the cause. The following will discuss CEPA member company practices in terms of leak and rupture detection, shutdown and isolation of failure sites, and emergency preparedness.

Leak and rupture detection

CEPA member companies implement various methods to prevent leaks or ruptures from occurring on their pipeline systems. These methods include design and construction according to industry standards, cathodic protection, and extensive condition monitoring and mitigation programmes, such as the SCC Integrity Management Programme. In the event of a service leak or rupture, quick detection will reduce the amount of oil or gas that escapes, thus reducing the consequences for the public and the environment.

CEPA member companies also use a variety of methods to detect service leaks or ruptures along their pipelines. Methods complement each other to create a detection system capable of identifying a variety of leak sizes and ruptures on both oil and gas pipelines. CEPA member companies transporting crude oil and petroleum products follow the Recommended Practice for Oil Pipeline System Leak Detection (Appendix E, CSA-Z662-94), which they assisted in developing. The primary leak detection methods are:

- supervisory control and data acquisition systems (SCADA);
- computer-based pipeline monitoring systems;
- aerial/ground line patrol;
- third party reports;
- inspections by company personnel.

Supervisory control and data acquisition (SCADA) systems

Instrumentation at key points along the pipeline, and at compressor and pump stations, measures parameters such as service fluid flow, pressure and temperature. This data is gathered by computer, displayed in a central control centre, and constantly monitored by the control centre operators. The operators are able to evaluate irregularities in the data which could be characterized as a leak or rupture and, if necessary, initiate emergency response procedures.

Computer-based pipeline monitoring

In the case of pipelines transporting liquid hydrocarbons, data collected by the SCADA system is provided to a computer model. The model combines this information with a model of the pipeline configuration and calculates values for parameters which mimic the actual hydraulic behaviour of the real pipeline. Should a pipeline leak occur, the model will no longer be consistent with the SCADA data. The control centre operators will then follow a short procedure to determine whether there is a false alarm or an actual leak. If this evaluation determines that there is a leak, the pipeline is shut down and mitigation personnel are dispatched to the leak or rupture site.

Aerial/ground line patrol

Pipeline company personnel perform visual inspections of the pipeline right-of-way, using aircraft or by walking or driving. They monitor the right-of-way for geotechnical problems, exposed pipelines, and encroachment by third parties. They also look for leaks that are too small to be detected by other means. The frequency of these inspections varies according to the terrain, patrol method, population density, and pipeline mitigation history.

Third party reports

Pipeline markers at road crossings, and landowner awareness programmes conducted by pipeline companies, assist in providing members of the public who may discover a pipeline leak with contact telephone numbers of company operating and mitigation personnel. Other companies that share the right-of-way are also informed about the pipeline system and will advise the pipeline company of leaks or unusual conditions.

Inspections by company personnel

Pipeline company mitigation personnel continually monitor the pipeline for leaks or unusual conditions during the course of their daily activities.

Shutdown and isolation of failure sites

Pipeline isolation valves and their activation are an integral part of the emergency response process after a service leak or rupture has been detected. Pipeline systems are divided into segments by valves which can be closed to isolate that segment in the event of an emergency or to allow mitigation to be performed on that segment. The valve spacing is determined in accordance with CSA-Z662-94 and is proportional to the number of dwellings (class locations), accessibility, and the potential hazards of the fluid being transported.

Natural gas pipelines

Pipelines transporting sweet natural gas have valves on the mainlines and on the crossover lines connecting two or more mainlines. The spacing of the mainline valves is normally no greater than 30 kilometres. Most mainline valves are capable of being actuated automatically by a pressure sensing device and a gas/hydraulic valve operator. Should the pressure on either side of the valve fall below a certain value, the sensing device will cause the valve operator to close the valves both upstream and downstream of the rupture site.

When a pipeline rupture is detected, operating personnel are dispatched to ensure that the mainline valves upstream and downstream of the rupture have closed. They then lock out these valves to prevent them from being inadvertently opened. In the event of a pipeline rupture, compressor stations are shut down, and the suction and discharge valves closed, and the gas is automatically vented from the station yard. All station bypass valves will remain in the closed position.

Liquid hydrocarbon pipelines

Pipelines transporting low vapour pressure (LVP) liquids such as crude oil and refined products have valves at all pump stations, as well as on both sides of major water crossings and at other locations, to limit damage from accidental discharge. As a minimum, valves at the pump stations can be shut and the pipeline segment isolated remotely by the control centre operator. Other valves which may be closer to the leak can be closed manually by pipeline mitigation personnel. The principal hazards are related to environmental damage, and the placement of these valves has proved to minimize damage to recoverable levels.

Pipelines transporting high vapour pressure (HVP) liquids such as propane and butane through locations with class 2 population density have valves which are spaced no more than 15 kilometres apart, as well as valves on each side of these locations. The valves are remotely operated from the control centre. Remotely controlled valves are also located on both sides of major water crossings. Because of the possibility of dense or neutrally buoyant vapour clouds during a release of these fluids, the valves have been installed at strategic locations to minimize the consequences.

Pipeline isolation valves form an important component of a pipeline company's ability to respond to a pipeline leak or rupture and have contributed to the pipeline industry's exceptional safety record. The standard for locating and actuating these valves was developed based on the number of dwellings, accessibility, and the potential hazards of the fluid being transported. CEPA holds that current pipeline shutdown and isolation practices are adequate for all known threats to pipeline integrity.

Emergency response

CEPA member companies have developed and implemented emergency response plans in order to provide prompt and effective response to a release of natural gas or hydrocarbon liquids. Emergency response is a process designed to protect the health and safety of employees and the public, and to minimize the impact on property and the environment. Because of the linear expanse of pipelines, each pipeline will have a number of emergency response plans to address specific hazards at different locations on the pipeline.

Emergency response plans have evolved over the last decade from a purely technical function, carried out by pipeline personnel in reaction to an emergency, towards a process that has become well documented within the companies and integrated with the community. Each CEPA member company has developed emergency response plans to address the particular hazards posed by the release of fluid being transported on its pipeline. Four major components of an emergency response plan are planning, resources, training and testing, and community participation.

Planning

CEPA companies have developed comprehensive emergency response plans designed to address all aspects of emergency response, including hazard identification, designation of environmentally sensitive areas, emergency response organization, roles and responsibilities, emergency procedures, notification and reporting procedures, internal and external resources, and communication systems. These plans are developed by company personnel representing a range of different groups involved in responding to the emergency. The plan is coordinated by an individual specifically designated by the company, and its implementation is the responsibility of the company management. Some companies also solicit input from local community authorities. These plans are updated at least once per year. Emergency response directories listing emergency contractors, government agencies, local emergency services, and industry emergency contacts have also been prepared and widely distributed.

Resources

CEPA member companies have the equipment and personnel to provide initial response capability for all areas that could be impacted by the types of fluids they transport. In order to ensure sustained response efforts, the companies arrange for local contractors, suppliers, and mutual aid groups to be available to provide necessary services. Companies operating liquids pipelines will store specialized emergency response equipment (oil spill contamination boom, boats, skimmers, etc.) in trailers at strategic locations along the pipeline system. This equipment supplements standard company equipment which may also be used during an emergency. Additional equipment and expertise is also available through oil spill cooperatives and mutual aid groups, which arrange to pool their resources in order to enhance response capabilities.

Training and testing

All field and head office personnel assigned emergency responsibilities receive training, on a regular basis, on the contents of emergency response plans and on their respective roles. Particular emphasis is placed on internal and external notification procedures, incident coordination processes, and locating other critical information in the plan. CEPA member companies transporting liquids provide training on the deployment of spill response equipment on land, streams, rivers and lakes along the pipeline system. Companies that transport HVP liquids or sour gas also provide training on flaring a cloud of these gases so as to avoid danger to the public.

In addition, CEPA member companies test their emergency plans to ensure that they are current, comprehensive and effective. Testing is accomplished through "exercises" which simulate the actual emergency. These exercises also enable personnel to learn by practising. Two types of exercises commonly used by CEPA member companies are tabletop and field exercises.

Tabletop exercises are usually held in a conference room setting and promote responses from participants that are very similar to those expected in a major emergency. This type of exercise is informal and free of the stress and time constraints of a real emergency. Participants discuss a prepared emergency scenario. The emphasis is on problem-solving rather than decision-making.

Field exercises are major emergency response exercises intended to provide a realistic simulation of an emergency response. A major exercise is similar in content to a tabletop exercise, except that all required resources are deployed under stresses and time constraints similar to those of an actual emergency.

Following the exercises, participants review achievements, identify areas for improvement, and formulate action plans to address these areas.

Community participation

CEPA member companies work with community officials and emergency responders, including municipal governments, regulatory agencies, and police, fire, ambulance and mutual aid groups, to undertake joint emergency planning and training. These activities familiarize the external agencies with pipeline locations, and the properties of the petroleum products transported, and promote coordination of emergency response efforts in the event of a pipeline emergency. This process continues to evolve, as there are many agencies to work with along the extensive pipeline routes.

Emergency preparedness and response has evolved to the point where all CEPA member companies have developed and tested well organized response plans for any pipeline emergency. CEPA pipeline companies are focusing on prevention and mitigation of pipeline failure and are confident that current emergency response practices are effective. ◆

Report of the OECD Workshop on Pipelines

Experts at the OECD Workshop on Pipelines (Prevention of, Preparedness for, and Response to Releases of Hazardous Substances), held in 1996 in Oslo, agreed that pipelines provide a generally safe and, for certain substances, a vital means for transport. The pipeline safety record indicates that few accidents with significant impacts on health or the environment have occurred in OECD countries. However, there remains a potential for significant loss of containment with adverse consequences. In addition, anecdotal evidence indicates that some non-OECD countries have significantly poorer safety records. That the potential for loss of containment is significant can be illustrated by a few figures. *Pipe Line and Gas Industry* recently reported that over 22,000 kilometres of new pipelines were planned worldwide in 1996. Most of these new lines will transport natural gas, with several major new transmission routes planned. The Europe-Maghreb Pipeline project was due for completion in 1996, the final 350 kilometres of the Goldfield Gas Pipeline project were scheduled for completion in 1997, and in Europe, the Interconnector project for an offshore line will link the UK to mainland Europe. In addition to oil and gas pipelines, many lines also supply the petrochemical industry worldwide. Some of these transport toxic substances, such as ethylene, ethane, natural gas liquids, ammonia and chlorine.

When accidents do occur, pipelines have the capacity to cause multiple injuries and fatalities, extensive property damage and environmental pollution. Table 1 shows some recent examples of pipeline accidents with their causes and consequences. Given this accident potential, pipeline safety performance has always been an important issue to regulators. Industry also recogniaes that its activities should not harm the public or the environment, and that it is in its own best interest to maintain a high level of safety. Pipelines are therefore, generally, designed, constructed and operated with a high degree of concern for safety. The Responsible Care approach, with its objective of continuous safety improvements, developed by the (petro)chemical industry, is increasingly being applied to pipelines.

It is probably a reasonable simplification to state that, in the context of oil and gas pipelines (which represent by far the largest proportion of the petrochemical pipelines), onshore high-pressure gas pipelines are of primary concern because of their potential impact on public safety, whereas oil pipelines, both onshore and offshore, are of primary concern because of the environmental risk they represent.

Pooling of data

Where accident prevention and preparedness are concerned, there are almost always important lessons to be learned from past accidents, incidents and near misses. For pipelines, this is made difficult by the simple fact that major accidents are so rare. The experts at the OECD workshop therefore stressed the need for pooling of information among countries in order to benefit from experience. They also stressed that, at present, data are difficult to collect and those that do exist in different countries or collection schemes are difficult to compare. This is due to a lack of standardiaed criteria for reporting, and to differences in the nature and extent of information provided to the various schemes. Another problem noted was the difficulty of assessing accidents with environmental consequences, due to the lack of experience in quantifying environmental damage.

Table 1
Recent examples of pipeline accidents

Date	Location	Description
28/11/96	Assam, India	Explosives planted by pro-Assam guerillas damaged two oil pipelines; fire and spillage ensued. The fire was extinguished after five hours. Repairs took two days.
1/12/96	Colombia	Over 350 tonnes of crude oil spilt into the San Pedro River when terrorists dynamited Colombia's second largest pipeline. This was the tenth attack of its type in 1996. The total amount of oil spilled in the ten attacks was 32,000 tonnes.
9/1/97	Dollard, Canada	A total of 35,000 litres of oil leaked from a damaged pipeline owned by Mobil Oil in one night.
16/1/97	Saratov, Russia	Over 1,200 tonnes of oil leaked from a ruptured pipeline. Most settled in a ravine, but about 400 tonnes spilled into the river Volga. A dam was built in a tributary of the river to prevent further pollution.

Regulatory approaches

Although the primary responsibility for the safe operation of pipelines rests with the operator, public authorities play a role and have responsibilities at various levels, one of their major responsibilities being setting of goals and giving leadership when setting up regulatory schemes. Well developed partnerships between public authorities and industry are also an important tool which can help to meet safety needs. It may often be desirable to involve other stakeholders such as representatives of workers and community-based organizations, in the decision-making processes of public authorities.

A general survey conducted in connection with the OECD workshop revealed common elements in most regulatory schemes. However it was also noted that there are significant differences with respect to safety practices for onshore and offshore pipelines, reflecting the focus on environmental risks for offshore installations and on human health and safety for onshore ones. This may lead to the development of different regulatory approaches in the future.

Safety management and use of standards

Safety management by industry is an important tool for prevention of accidents and for prioritiaing of spending on safety. If this tool is to be effective, it needs to be considered as an integral part of companies' wider overall management systems.

An example of safety management systems used by operators is the Pipeline Integrity Management System (PIM), described at the OECD workshop by representatives of the pipeline industry. The key elements of PIM are: clear objectives and policies; a suitable organization with clear definitions of asset ownership and related responsibilities, and competent and trained staff; adequate standards and procedures; performance monitoring; and suitable audit/review procedures to identify shortcomings and make corrections.

Additional mechanisms which the industry could adopt to reduce risk – also discussed at the workshop – include: external impact protection (impacts from excavation equipment working nearby are the major cause of pipeline rupture); increased wall thickness; increased depth of burial; improved material quality; decreased stress; improved markings; improved route selection; and improved monitoring.

Ageing and disused pipelines

In general, ageing pipelines are not a major problem at the moment since most pipelines are still within their design life. However, as pipelines age, additional monitoring may be required in order to continue to ensure their integrity.

For pipelines no longer in use, there are three options, i.e. removal, outright abandonment, or abandonment with additional actions. For any given pipeline, all of the risks associated with each option must be assessed on a case by case basis, bearing in mind that the solution may well be a combination of methods.

As a means of transport, pipelines have the considerable advantage of being able to move large quantities of hazardous substances quickly, relatively inexpensively, and reliably, with relatively few associated impacts on the environment. The participants in the workshop recommended that the use of pipelines should be seriously considered when new transportation routes for conveying large quantities of dangerous substances are planned.

The Report of the OECD Workshop on Pipelines (Prevention of, Preparedness for, and Response to Releases of Hazardous Substances) *is available at no charge from the OECD Environmental Directorate, Environmental Health and Safety Division, 2 rue André-Pascal, 75775 Paris Cedex 16, France. Fax: (33-01) 45 24 16 75. E-mail: ehscont@oecd.org. For the complete text of this and many other publications, consult http://www.oecd.org/ehs/.*

APELL in Chile: towards a port-oriented strategy

Alberto Maturana Palacios,* National Director, Oficina Nacional de Emergencia, Ministro del Interior, Santiago, Chile

Abstract

Experience in Chile has shown that APELL principles can be combined with local initiatives in emergency planning. APELL's non-exclusive, "not-the-only-answer" approach to industrial accidents can also be applied to other types of emergencies, including natural (or a combination of natural and industrial) disasters. APELL is therefore especially appropriate for application to ports. The APELL approach promotes the participation of potentially affected communities, another important consideration in regard to ports.

Résumé

L'expérience chilienne a montré qu'en matière de planification des interventions d'urgence, les principes d'APELL pouvaient être combinés à des initiatives locales. L'approche non exclusive d'APELL pour les accidents industriels peut s'appliquer à d'autres situations d'urgence, notamment aux catastrophes naturelles et aux situations combinant une catastrophe naturelle et un accident industriel. APELL est par conséquent particulièrement adapté au contexte portuaire, d'autant plus que ce programme préconise la participation des populations exposées, aspect très important dans ce contexte.

Resumen

La experiencia ha demostrado en Chile que los principios APELL pueden combinarse con iniciativas locales en la planificación de emergencias. También se puede aplicar el enfoque de APELL de "no exclusividad" y de "respuesta no única" respecto a los accidentes industriales a otros tipos de emergencias, incluso a los desastres naturales (o una combinación de ambos : desastres industriales y naturales). Por consiguiente, APELL es especialmente apropiado para la aplicación a los puertos. Su enfoque fomenta la participación de comunidades potencialmente afectadas, lo que constituye otra consideración importante respecto a los puertos.

Introduction

Ports are extremely interesting from the civil protection point of view. Most of the world's ports are part of cities, and often of large cities. They are complex interfaces between land and sea and between two major modes of transport – terrestrial and maritime.

Maritime transport is relatively well regulated by international laws and agreements. However, many ports are administered by a mixture of military, public and private authorities, often with important overlaps and duplication of tasks. While such administrative structures may operate well under normal circumstances, they can easily collapse when faced with emergencies. If, in addition, there is inadequate response capability in terms of planning, training, allocation of roles, and provision of resources (compounded by low awareness and poor understanding in the community), the situation can become critical very quickly. In such cases the consequences of a disaster will often be determined more by the quality of the decisions made, and by the response capabilities, than by the event in itself.

Chile's present economic growth, with increasing GNP and new foreign trading partners, has been accompanied by major efforts to modernize the country's ports and improve the efficiency of their infrastructures. Chile once mainly produced copper, but it now exports a whole range of commodities including not only copper but fishmeal, forestry products, fruit, paper, cellulose, fertilizers, salt and vegetables. The new open economy, combined with efforts to promote exports, has led to a rapid increase in the total amount of cargo handled by Chilean ports as compared with, for example, ten years ago (see **Figure 1**).

The private sector has been invited to provide more services within state ports. This new approach eliminates domestic preference and introduces a framework of full transparency and competitiveness. At present, there are eleven state-owned ports and 19 private ones. State-owned ports handle around 50 per cent of total cargo.

Chile's risk profile is one of the most interesting anywhere. The country faces the world's largest ocean, which affects weather patterns globally and produces extreme climatic events. The coast extends more than 4000 km (a distance equal to that from the North Pole to Africa) through a variety of geographical and climatic zones. Chile also lies over the Nazca tectonic plate, one of the world's most seismically active subduction zones, which causes earthquakes and volcanic activity. Chile has more than 50 active volcanoes. Moreover, the technological and social changes in a country with rapidly developing new industries, products and clients are creating new risk scenarios.

Despite the fact that Chile's economy is doing well and its health indicators are comparable to those of developed countries, poverty, marginality and extreme vulnerability to potential hazards remain impediments to real development (expressed as improved quality of life, equity and social justice, rather than in terms of conventional indicators). Recent violent storms, probably the most destructive hydro-meteorological event in the country this century, have shown just how important these considerations are for assessing the effects of disasters on vulnerable sections of the population.

The introduction of port-oriented APELL activities in Chile

In the recent past, major Chilean ports have been paralyzed by earthquakes and fires. In 1985 an earthquake measuring 7.8 on the Richter scale occurred at Valparaiso and San Antonio, now the country's largest ports, killing 177 people, injuring 2575, and causing something like a million to become unemployed. Approximately 150,000 homes were destroyed or severely damaged. The most severely affected area was around San Antonio. The port was virtually out of service for 18 months due to the serious damage to docks and cranes.

In 1992 a fire, thought to have originated on a ship undergoing maintenance, occurred at San Vicente Bay. It was spread across the bay and through the entire port zone and industrial area by wind. Among other damage, some 60 fishing and middle-tonnage vessels, seven fish processing factories and their port facilities, and nine fish processing ships were destroyed. One person died and around 1000 lost their jobs. The fire almost spread to twelve oil storage tanks at nearby refineries and distribution terminals. These tanks, which contained around 40,000 m³ of petroleum products, were located near an area where 200 families lived. Rehabilitation and reconstruction work lasted six months.

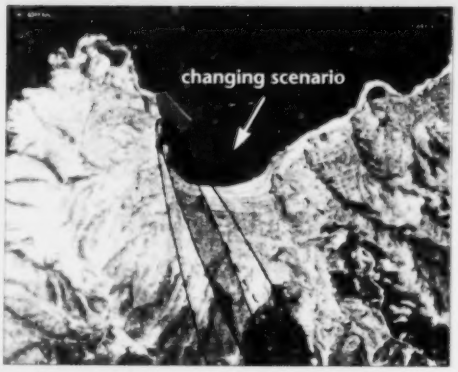
San Vicente was probably the only port in Chile at that time to have an intersectoral emergency plan. Five hundred highly professional firemen brought the fire under control in three and half hours. The firemen came from 19 fire brigades in Lirquen Port, Talcahuano and Concepción. There was good cooperation with firemen from the Chi-

APELL in action – over a million students involved in a national drill

"National Civil Protection Day" is observed in Chile on 10 October. To mark the occasion in 1996, ONEMI organized a national emergency exercise aimed mainly at schools and colleges. Over a million students in nearly 3000 schools in all 13 regions took part. More than 7300 police, firemen and public health personnel also took part, and 1200 vehicles were mobilized.

During the exercise students were asked to select a disaster scenario and to integrate evacuation and police, fire-fighting and public health actions into the exercise. The most popular choice of scenario involved a technological disaster in Valparaiso. The exercise was based on the spread of fire, followed by the explosion of chlorine tanks. This is a highly realistic scenario for the Valparaiso dock area.

Using the APELL Cameo, Aloha and Marplot tools, students were able to order correct and effective actions for the orderly and safe evacuation of affected areas. They were also able to develop new evacuation actions as the scenario changed due to unexpected weather conditions which altered the direction of the toxic cloud. The APELL tools allowed them to react quickly to evacuate the newly affected areas.



Screen grab showing the changing scenario students had to deal with

This was the largest such exercise in Chilean history and provided a good demonstration of the way the APELL tools and real-time information links can help technicians and emergency authorities react to the changing dynamics of a situation. The exercise provided enough experience to form the basis for a "National School Security Plan" agreed in March 1997 with the Chilean Ministry of Education. The APELL process, together with locally developed techniques such as "microzonification", will now be a part of the activities, special actions and regular drills in Chilean schools. Schools and students are part of the "thinking community" and can play an important role in guaranteeing safety in a changing world.

lean Navy, local airport fire brigades, and the most affected companies. The experience gained proved seminal for the implementation of APELL in Chile.

Awareness of the APELL process in Chile was instigated in 1993-1994 by the visits of APELL representatives during a mission to Latin America. Their enthusiasm and energy during initial meetings with the author, then National Director of the Ministry of the Interior's National Emergency Office (ONEMI), was infectious. The first important APELL activity in Chile was a workshop on preparation for disasters and the APELL process organized by ONEMI in April 1995. It was attended by the National Planning Minister. One week later a joint effort involving the UNCHS (UN Centre for Human Settlements) Sustainable Cities Programme and ONEMI resulted in the first APELL workshop being held in Concepción. This workshop, whose focus was a wide-ranging analysis of the San Vicente fire, was well attended by representatives from all sectors. Following the workshop, authorities at the regional, provincial and county levels gave increased attention to improving emergency planning.

APELL has subsequently become an important part of our national strategy. Its non-exclusive and "not-the-only-answer" approach to technological emergencies means that the APELL concept can be applied to all types of disasters: natural, technological, or a combination of these (now known as "Natechs"). The approach is similar to the Chilean one (see below) in that it fosters the integration and participation of local communities. The APELL tools have been a valuable addition to the prevention and preparedness arsenal and have proven highly effective in strengthening coordination links between the public, private and military sectors as well as with NGOs, academic institutions, international bodies and church organizations. The Cameo, Aloha and Marplot software packages have been extremely useful in this context, helping to generate credibility for our national agency, promote training activities, and build up a national documentation centre. Endorsement of these valuable tools by the US Environmental Protection Agency and by UNEP's Industry and Environment centre also helped to validate their use in each of Chile's 13 regions.

Combining the APELL process with preparation for natural disasters

A technique developed in Chile is the "microzonification" of risks and resources. This technique is based on the same principles as APELL, but it is mostly oriented towards the risk of natural disasters. If during the microzonification process a community identifies the main risks to which it is vulnerable as technological, the APELL process is used. The two processes have been combined very successfully. Since 1994, an in-depth overhaul of Chilean national civil protection procedures has allowed APELL tools and methodologies to be applied with increasing frequency

Since 1985, ONEMI has been providing the APELL computer tools (Cameo, Aloha and Mar-

Cooperation between industry and local communities – the example of SONACOL and Curacavi

In November 1996 SONACOL, a major Chilean company responsible for pipelines and transport of fuel, gas and derivatives, was invited by ONEMI to join the "microzonification" effort in the small rural county of Curacavi near the Chilean capital of Santiago.

This process was started as the result of two important spills from one of the company's pipelines running through the county. One of these spills was the direct result of terrorist action, and the other was due to the operation of heavy machinery which should not normally have been used in the vicinity of the pipeline.

The spills caused anxiety to the authorities and alarm and anger in the local community. However, in spite of these accidents the company is proud of its safety record and gives a great deal of importance to its relations with the community. It therefore accepted the county authority's invitation to participate in the ONEMI action as a means of clearing away doubt and anxiety and improving relations.

Full information was provided to the authorities, and to the community, on the characteristics of the pipeline, including its operation and safety standards. Preventive maintenance under United States and international standards was described, along with the constant monitoring of the pipeline with the "smart pigs" system and regular patrolling.

The company also produced a full profile of SONACOL activities and a special brochure on pipeline safety. In response to a special request from the Curacavi community, the company produced a leaflet on safety actions in the event of an emergency giving clear instructions on "what to do, how to do it, and with whom". A complex drill with full community participation is also being developed. Within this framework SONACOL, which had offered to provide a daily radio report to the local emergency committee, was invited to a training workshop on radio communication in case of emergencies.

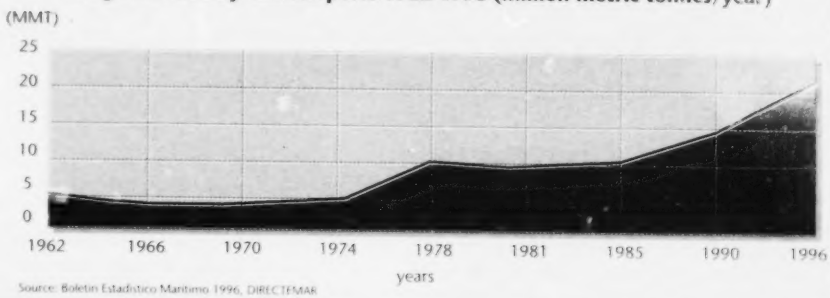
The combined action of these three partners is an excellent example of how authorities, a community, and industry can work together to improve preparedness for emergencies at the local level.

plot) nationwide by duplicating manuals and discs and by holding four training workshops targeting different groups. The first workshop, in September 1995, was oriented towards industrialists, managers, naval officers, and chief emergency commissioners and civil protection managers from the Valparaiso port area. The second, held in the Santiago metropolitan area in October 1995, was attended by specialists from the "Conama" (the national environment commission), the metropolitan health environment service, and police and fire officers. The third, in April 1996, addressed ONEMI's own needs and was attended by civil protection, telecommunications and computer specialists. The fourth, held in Iquique in November 1996, targeted managers, industrialists, social insurance organizations, county emergency specialists (*Municipalidades*), and provincial and regional emergency directors.

Another initiative, begun in 1996, is the National Civil Protection Documentation Centre. The main purposes of the centre are to build up a large database to provide relevant and up-to-date information from national and foreign sources; to support the national civil protection system's decision-making capacity in emergency and disaster situations; and to provide background studies for analysis and bibliographical support to ONEMI and other institutions planning projects and programmes. The centre is to be built up in three stages – physical and technological implementation; organization of a data framework; and operation and service – in order to create an interactive channel for communication between Chilean and foreign professionals in disaster prevention.

Looking to the future, ONEMI's main strategy is embodied in a five-year plan, "For a Better Quality of Life", in which the APELL process plays a major part. The aim of the plan is to bring about a change in attitude both before and after an emergency or disaster. One of its major components is a professional training programme aimed at officials and decision-makers, technicians and operational offices, and community stakeholders and representatives. The approach is divided into three levels of differing complexity, leading to what is at present a "virtual" diploma in emergency management. The possibility of providing formal qualification in this subject is currently being discussed by two of Chile's leading universities.

Figure 1
Cargo handled by Chilean ports 1962-1996 (million metric tonnes/year)



Source: Boletin Estadistico Maritimo 1996, DIRECTEMAR

Other forms of international cooperation

Chilean civil protection agencies are involved in, and are developing, international cooperation projects and common activities currently being sponsored by the DHA (UN Department of Humanitarian Affairs), UNDP (UN Development Programme), UNEP IE, US OFDA/AID (the office of US AID responsible for foreign disaster assistance), and the JICA (Japanese International Cooperation Agency). For example, a three-year, $US 350,000 programme for reinforcement of the national civil protection system, being run with UNDP, is in its final phase. A volcano-monitoring project is also being run with the British Overseas Development Agency (ODA) and DHA.

OFDA/USAID has provided three modules which, via ONEMI, have reached the national system: a Disaster Management Programme, a Train the Trainers Programme, and a Situation Needs Assessment module. OFDA/USAID has provided a lot of help in enabling Chilean professionals and technicians to obtain qualifications and in providing training methodologies which have been incorporated into Chilean strategies. The JICA has also provided excellent training opportunities through scholarship programmes, mainly oriented towards natural hazards. A good many ONEMI professionals have availed themselves of these opportunities. Discussions are in progress with JICA's representative in Chile and with its Tokyo headquarters to include technological hazards and emergencies in the future.

Not only has Chile benefited from foreign cooperation, but Chilean strategies have also become increasingly oriented towards "horizontal cooperation". In this context, Chile has provided humanitarian aid for disaster relief following earthquakes in Haiti and Ecuador and severe flooding in Costa Rica and Peru. Chile is also working with Argentina on an integrated volcano-monitoring project extending over the longest volcano frontier in the world. Of the 1500 volcanoes in this area, 60 are highly active.

APELL has played a major role in the development of Chile's accident prevention strategies, both national and international. The Chilean experience has shown that APELL principles can be combined with local initiatives to help increase understanding of disasters, an essential element for true sustainable development.

San Vicente port fire, 1992

Notes

1. The term "microzonification", as used in the Chilean context, refers to the development of an accurate description of hazards, vulnerability and resources at the local level with full integration and participation of the local community. The methodology used, known by the acronym AIDEP, concentrates on risks at the local level. It involves analysis of local emergency history; on-site investigation; inter-sectoral discussions; the drawing up of simple maps showing hazards, vulnerability and resources; and emergency planning.

** Dr Maturana is the National Director of ONEMI (the central Chilean civil protection organization). Since 1996 he has been president of the Ibero-American Association of Civil Protection and Protection Organizations (22 Spanish- and Portuguese-speaking countries.) He has recently been designated a member of the Scientific and Technical Committee of the UN Disaster Reduction Decade.*
Contact details: Fax: (56) (2) 6721899; E-mail: amaturan@onemi.cl

Prevention of industrial accidents in the Arctic

Ulf Bjurman,* Deputy Assistant Under-Secretary, Ministry of Defence, Department for Civilian Preparedness and Civil Protection, Vasagatan 8-10, S-10333 Stockholm, Sweden

Abstract

Prevention of industrial accidents must be given the highest priority in the Arctic, due to its sensitive environment and limited emergency response resources. APELL tools can be used to promote efficient communication and cooperation with the indigenous peoples who live in the region, often in small communitites and in remote locations. In workshops organized within the framework of Arctic cooperation, the APELL Programme plays a significant role in regard to both prevention of and preparation for industrial accidents.

Résumé

En raison de la fragilité de l'environnement et des possibilités extrêmement limitées d'intervention d'urgence dans l'Arctique, la prévention des accidents industriels doit être une priorité absolue dans cette région. Les outils du programme APELL peuvent être utilisés pour promouvoir une communication et une coopération efficaces avec les peuples indigènes de cette région, qui vivent souvent au sein de petites communautés et dans des endroits très retirés. Dans les ateliers organisés au titre de la coopération dans l'Arctique, un rôle important revient au programme APELL en matière de prévention et de préparation aux accidents industriels.

Resumen

En el ártico se debe acordar una máxima prioridad a la prevención de accidentes industriales, debido a la sensibilidad del medio ambiente y a los escasos recursos de respuesta ante emergencias. Se pueden emplear herramientas APELL para promover una comunicación y cooperación eficaces con los indígenas que habitan en la región, a menudo en pequeñas comunidades y en lugares remotos. En talleres de trabajo organizados en el marco de la cooperación ártica, el Programa APELL desempeña un papel significativo respecto a la prevención y a la preparación para los accidentes industriales.

Introduction

In 1991, the Government of Finland took the initiative in creating the Arctic Environment Protection Strategy (AEPS) by hosting a Ministerial Conference in Rovaniemi. Since then, Ministerial Conferences have been held in Nuuk, Greenland, Inuvik, Canada, and Alta, Norway. In 1996, on the initiative of the Government of Canada, a declaration on the creation of an Arctic Council was signed in Ottawa. AEPS is now a part of the Arctic Council, which covers a wide scope of cooperation between the Arctic Countries (Canada, Denmark, Finland, Norway, the Russian Federation, Sweden and the United States). Organisations of indigenous peoples are permanent participants in this cooperation.

The practical cooperation is managed under a group of Senior Arctic Officials (SAO) in four programmes, with a working group for each: the Arctic Monitoring and Assessment Programme (AMAP), the Conservation of Arctic Flora and Fauna (CAFF), the Preservation of the Arctic Marine Environment (PAME), and Emergency Prevention, Preparedness and Response (EPPR). In the work of the Arctic Council, issues concerning sustainable development will play a more significant role than has been the case in AEPS.

The risks of emergencies in the Arctic

The Arctic is basically the area above the Arctic Circle, but in order to cover their different practical needs the different programmes have found it appropriate to include parts of the Arctic countries further south than this. During most of the year this area is very cold, although in summer there is a period when there are 24 hours of daylight.

Conditions are very different in the various parts of the Arctic. In North America, the Arctic communities are small and industrial activity is generally limited both in terms of size and of geographical areas. In the Euro-Asian part of the Arctic there are considerable industrial acitivies as well as maritime transport. The population of the Barents region of northern Fenno-Scandinavia and Northwest Russia is four to five million. Other parts of the Russian Arctic also have significant populations. For instance, about 300,000 people live in the Norilsk area.

EPPR has completed a Risk Analysis on Environmental Threats to the Arctic which indicates that these risks are mainly associated with shipping and with other forms of transport of oil and other dangerous goods; oil and gas production; mining; the pulp and paper industry; and energy production. This analysis will be updated and refined based on further experience gained in EPPR. There will also be a scientific analysis of risks in relation to information gained in other Arctic programmes, and in relation to the adequacy and effectiveness of existing international agreements and arrangements intended to deal with these risks. Many such mechanisms are applicable in certain respects, or in certain parts of the Arctic. The result of this analysis will form a basis for the assessment of the need for further action.

In this context, it can be noted that all the Arctic countries have signed the UN/ECE Convention on the Transboundary Effects of Industrial Accidents. Prevention of such accidents is also given the highest priority by the emergency services in, for example, Finland, Russia and Sweden.

In its future work EPPR plans to carry out an analysis of identified high-risk activities in the Arctic, with the aim of developing source control management and prevention strategies to meet these risks.

Risk identification and risk assessment are a necessary basis for preventive and preparedness measures and for planning future EPPR activities. This is very much in line with the APELL Programme. Prevention of industrial accidents must be given the highest priority in the Arctic, due to its sensitive environment and limited emergency response resources. Experience has also shown the need to develop efficient risk communication between different stakeholders.

Involvement of indigenous peoples

Indigenous peoples are a majority in the Arctic area of North America, living as a rule in quite small communities. Inuits are clearly the majority population in Greenland, with its home rule. In Fenno-Scandinavia the Sami are a small part of the population, herding their reindeer and having special rights. In the Russian Federation there are about 30 indigenous Arctic peoples. The indigenous peoples in Russia often live in small communities.

It is essential to establish cooperation with the indigenous peoples on emergency prevention and preparedness. An emergency can have very serious consequences for these peoples' traditional way of life. Moreover, their knowledge and experience can provide a considerable contribution. In many situations they can play a significant role in a notification system, often being in a position to provide better and earlier reports on environmental threats or on pollution than can other sources. In

Box 1 – The Arctic region

There is no universally accepted definition of the term "Arctic", and the region can be defined in several ways. The geographical definition is that part of the world north of 66°32'N, the latitude of the Arctic Circle. Climatically, the Arctic is often defined as the area north of the 10° July isotherm, i.e. north of the region which has a mean July temperature of 10° C. A third definition uses the tree line as the boundary. This locates the beginning of the Arctic further south than the previous two definitions, as it assumes that the region starts in the transition zone where continuous forest gradually gives way to treeless tundra. A marine boundary can be fixed at the points where the cool waters of the Arctic Ocean, diluted by melting ice, meet the warmer, saltier waters of oceans further south.

For the purposes of the AEPS Emergency Prevention Preparedness and Response Working Group, the Arctic region (as shown on the map below) was defined as all of the territories of Canada, Finland, Greenland, Iceland, Norway, the Russian Federation and the United States north of the Arctic Circle, as well as the following areas:

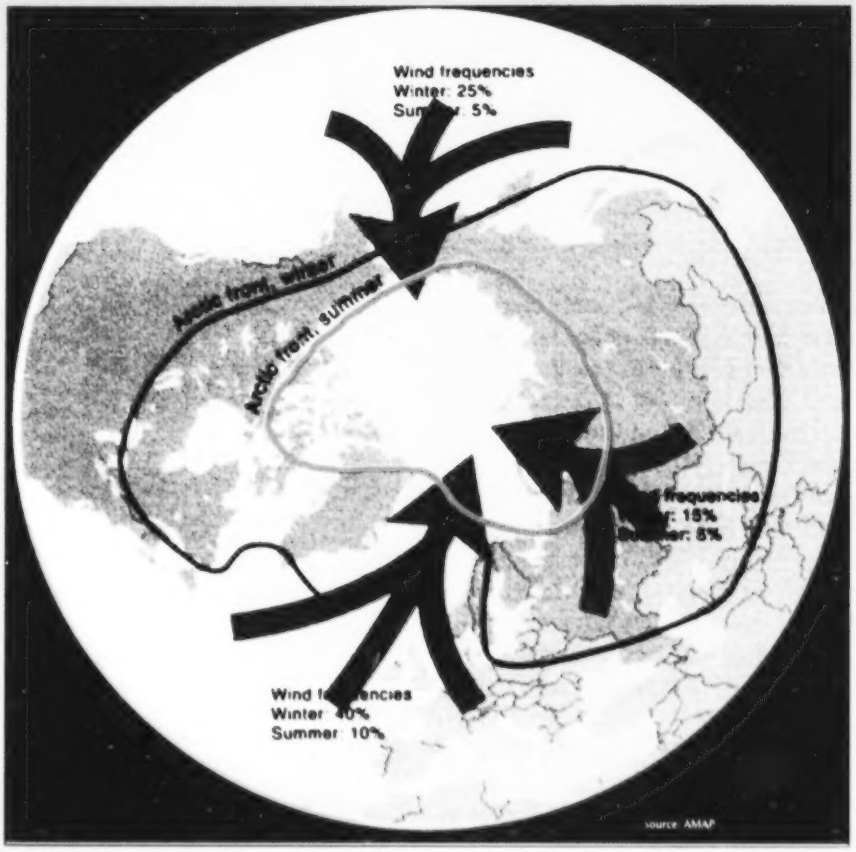
- **Canada:** the Northwest Territories, the Yukon, and the waters of the Hudson Bay, James Bay, Quebec north of 60° and Ungava Bay
- **Finland:** the entire provincial district of Lapland south of the Arctic circle
- **Greenland:** all of Greenland
- **Iceland:** all of Iceland and adjacent seas
- **Norway:** Szalbard, Jan Mayen, and a small area south of the Arctic Circle encompassing the Saltfjellet-Svartisen National Park and the municipality of Rana
- **Russian Federation:** The Arctic boundary runs west of the Finnish border along the Arctic Circle and includes all the territory north of a line which angles southward just west of Usinsk. The boundary then follows the Nizhnyaya River west across Siberia, then runs along the Ilyuy and Alden rivers, continues west across Siberia, and then crosses the Zaliv Shelikohova south of Taygomos. The boundary then crosses the Kamchatka Peninsula and runs just north of Karaginskiy Island.
- **Sweden:** all of the provincial district Norbottens Lan lying south of the Arctic Circle
- **United States:** all United States territory north and west of the boundary formed by the Porcupine, Yukon and Kuskokwim rivers, including their watersheds; all contiguous seas including the Arctic Ocean and the Beaufort, Bering and Chukchi Seas; and the Aleutian Island chain.

About 13.4 million square kilometres (40 per cent of the AEPS area) is land.

The Arctic is not a uniform environment. Different geological histories, warm and cold ocean currents, and varying weather patterns bring diversity to the region. A circumpolar traveller would meet everything from the permanent ice cover of the High Arctic to the boreal forest of the subarctic, with a wide expanse of tundra in between.

Box 2 – Arctic pollution issues

The Arctic used to be thought of as a pristine environment. However, it is now clear that the region is subject to pollution from a range of sources, both local and distant, affecting its ecology and the health of the population. There are many pollution sources within the Arctic region causing contamination, mainly by heavy metals, hydrocarbons and radioactive substances. The region is also severely affected by transboundary movements of contaminants, including persistent organic pollutants (such as pesticides) and radioactive material originating outside the region. The particular climatic conditions in the region make recovery from environmental damage slower than in warmer areas of the globe and make the Arctic a potential sink or reservoir for many pollutants.



The position of the Arctic Front influences contaminant transport in the atmosphere. The figure shows the mean position of Arctic air mass in January and July and the winter and summer frequencies of winds driving the major south-to-north transport routes.

Metals

Much of the metal contamination in the Arctic comes from emission "hot spots". The most severe effects on ecosystems are found around pollution sources such as the nickel-copper smelters on the Kola Peninsula and in the Norilsk region of Russia, which have severely polluted nearby terrestrial and freshwater environments. Combustion of fossil fuels to produce electricity and heat is also a major anthropogenic source of heavy metals deposited in the region. Levels of metals such as cadmium and mercury are being monitored in the body tissues of several species of animals including caribou, a major source of food for indigenous people.

Hydrocarbons

The major anthropogenic source of hydrocarbon contamination in the Arctic is oil and gas development. However, other sources including releases from marine shipping, burning of fossil fuels, long-range transport, and natural oil seepage also contribute.

Accidental oil spills and chronic releases from poorly maintained pipelines and from ships constitute the greatest threat from petroleum hydrocarbons.

The Arctic is particularly vulnerable to spills because oil breaks down more slowly in the cold, dark conditions found there. The extreme climatic conditions also make remedial measures difficult to implement.

Persistent organic pollutants

Although use of organic substances such as pesticides has been very limited within the Arctic region, a whole range of persistent organic pollutants (POPs) has been found there. Levels are generally lower than in temperate areas, but some substances are present in concentrations at which they can affect animals. Effects include reproductive problems in birds, caused by DDT, and in some marine mammals, caused by PCBs and dioxin-like compounds.

The major source of POPs in the Arctic is the residue of widespread contamination of the global environment – the sum of past uses. Models of pathways and transport for DDT indicate that it is likely to persist for many decades.

Only a small part of the global burden of POPs will reach the Arctic, but this fraction is likely to cause problems because of the tendency of such substances to accumulate in the fat of Arctic animals and biomagnify in the food web. This latter effect means that they are found in greater quantities in species higher up the food chain, leading to high contamination levels in top predators including humans.

The cold temperatures in the Arctic are also thought to increase the region's propensity to act as a sink for POPs, leading to levels which are sometimes higher in the Arctic than in source regions.

Radioactivity

The major anthropogenic sources of radionuclides in the Arctic are global fallout from nuclear weapons testing, releases from European fuel reprocessing plants, and fallout from the Chernobyl accident.

Radionuclides captured by rain or snow contaminate vegetation and the soil, as does their dry deposition. Lichens and mosses with large surface areas that gather moisture directly from the air are particularly effective in gathering radionuclides from atmospheric fallout. As these are fodder for reindeer and caribou, a major food source for many indigenous people, they are one of the main

Canada it has been found that indigenous people can participate in the response to an oil spill. The Canadian Coast Guard therefore includes them in its training programmes.

The possibility of conducting an APELL workshop in Northwest Russia to develop the means for practical involvement of indigenous people in accident prevention and response is being investigated At such a workshop the APELL instruments would be used. The results could serve as an example and stimulate similar nationally organized APELL workshops in different parts of the Arctic in the future.

Workshops

In the workshops organized within the framework of Arctic cooperation, the APELL Programme plays a significant role in respect to both preven-

routes by which radionuclides reach people. Mushrooms also tend to take up radionuclides through their roots and are therefore another vector for contamination of the population.

There is also a concentration of possible future sources of contamination in the Arctic: storage of spent nuclear fuel, decommissioned nuclear submarines, nuclear reactors on land and in ships, and contained sources in the environment. The potential for exposure of people and biota is therefore higher than in other regions.

Transboundary sources and pathways

A significant part of the pollution load found in the Arctic region originates well outside it. Studies of the pathways by which pollutants reach the Arctic have revealed a pattern of transport by air and water from the industrialized areas of the world. Once in the region, the Arctic's geographical characteristics and cold climate cause many of the pollutants to accumulate there.

The atmosphere is the fastest and most direct route by which pollutants reach the Arctic, the transport occurring in a matter of days or weeks. Air transport patterns are dependent on the seasonal cycles of the major weather systems. The map shows the relative summer and winter positions of the Arctic front. In the winter and spring an intense high-pressure system over Siberia pushes the front far to the south; large areas of Eurasia which encompass major sources of pollution then fall within the Arctic air mass. This expansion of the Arctic front creates conditions favourable for air transport of particle-bound pollutants across the pole and explains why soot and sulphates from Eurasia are found contributing to the formation of haze throughout the lower layer of the Arctic atmosphere in winter and spring.

Volatile and semi-volatile compounds are carried to the Arctic in a cyclic, "multi-hop" process in which they first volatilize, are transported, and are deposited when lower temperatures cause them to condense. As temperatures rise again with seasonal change, they are revolatilized and continue their journey. Such pollutants accumulate in the Arctic because, once deposited there, the very low ground temperatures prevent their re-volatilizing.

Within the Arctic region, water (as liquid and ice) plays a major role in transport and storage of pollutants. Snow, rime ice (which forms when supercooled cloud droplets freeze on contact with snow crystals or surfaces) and dry deposition remove pollutants from the air but contaminate the surface on which they land. The substances brought down in this way often end up in melt water feeding rivers and eventually find their way to the ocean surface layers. Many of the volatile "multi-hop" pollutants have been in use for decades and deposits have built up in the oceans, being carried there either in run-off water from the land, by direct deposition, or through surface-water/air exchanges of gases. There are therefore concentrations in the oceans which may be many times higher than in the air. This is particularly true for the Arctic seas, as gases are more soluble in cold water than in warm. Pollutants will accumulate in the seas during cold periods and be released into the air with seasonal rises in water temperatures. Similarly, if restrictions on the use of polluting substances cause a reduction in levels of air pollution, the equilibrium between concentrations in the water and in the air will be altered. This will cause more of the stored pollutants to be released from the seas, a process which, given the decades of build-up, may persist for a considerable time.

Ice forming in the shallow continental shelves in the Arctic Ocean can include pollutants either deposited in the coastal waters or brought down by rivers. The continental shelves are primary sites for ice formation and melt. When melting ice breaks away from the shelves, it can travel a long way in the large clockwise gyre extending over the entire Canadian Basin (Beaufort Gyre) and in the current running east to west across the Eurasian Basin from the Siberian coast and out through the western Fram Straight (the Transpolar Drift). Ultimately, it may release its load of pollutants into the biologically productive shelf seas and into the North Atlantic, where they can enter the food chain.

Far from being an unspoiled environment, the Arctic is a focus for major atmospheric and marine pathways which result in the long-range transport of pollutants into and within the region, where the cold conditions cause them to accumulate. The Arctic is therefore a potential storage reservoir and/or sink for pollutants which may damage its delicate ecosystems and have long- term effects for the human population.

This brief description of the pollution issues in the Arctic is based on Arctic Pollution Issues: A State of the Arctic Environment Report, *published by the Arctic Monitoring and Assessment Group. Readers who wish for more information on the subject are referred to the report, which is available from AMAP, P.O. Box 8100, Dep.,N-0032 Oslo, Norway. They are also invited to consult the WWW site http://www.grida.no/amap*

tion of industrial accidents and the necessary preparedness for their occurrence. An APELL workshop was held in Petrosavodsk, Karelia, Russian Federation, in May of this year in cooperation with the Russian EMERCOM Ministry. The APELL Programme was presented, and the agenda was adapted to the particular risks in Karelia. Thus particular attention was given to risks in connection with the transport of dangerous goods.

Scenarios of realistic accidents with consequences for different parts of society in Petrosavodsk formed a basis for the deliberations. These scenarios enabled representatives of different authorities, of those involved in disaster medicine, and of industries and local bodies to play roles and discuss problems of mutual interest. The workshop also had other regular elements, such as work in small groups and the demonstration of how emergency services function.

The Petrosavodsk APELL workshop was an excellent experience, and another workshop is being planned for the end of this year in Murmansk. It will be devoted in particular to risks in Murmansk, such as those associated with port activities. Representatives from Karelia and Archangelsk are expected to present the progress made since the Petrosavodsk workshop. Some EPPR participants also plan to take part in a Russian workshop in Jakutsk, Siberia.

The APELL Programme also played a significant role in a workshop in Sweden in August on safe and clean industrial development in cold climates and icy conditions. The purpose of this workshop was to provide the opportunity for exchange of knowledge and experience among experts in the field of emergency prevention, preparedness and response in the Arctic countries. Follow-up activities are expected in different sectors of society, particularly in Arctic areas.

Another purpose of this workshop was to promote sustainable development and cooperation. Following an introduction on risk assessment, there were three sessions dealing with prevention and preparedness in regard to industrial activities; hazardous transport activities on land; and oil spills at sea. The workshop also provided the opportunity to present information on activities in the European Union related to the prevention of accidental maritime pollution through, *inter alia*, risk assessments for sea areas, in the field of civil protection and in the framework of the "Seveso Directive" regulating prevention and preparedness at hazardous industrial establishments.

All of these workshops will play a significant role in the long-term work on prevention of industrial accidents in the Arctic. The APELL Programme tools have proved most helpful in this work. Particular emphasis is being given to the development of communication and dialogue among the different stakeholders. The transsectorial approach which is a key element of APELL is new in many countries, and it needs to be improved in most others.

The workshops also establish natural networks between the relevant experts. These networks can facilitate future cooperation and exchange of knowledge and experience, including between experts in different countries.

Concluding comments

Since its start, the APELL Programme has proved to be of significant value in many countries and in different parts of the world. Basic needs are the same everywhere in respect to prevention of and preparedness for industrial accidents, even if different social, economic, climatic and historic conditions prevail.

The original APELL Handbook probably

Box 3 – Indigenous Arctic people are especially vulnerable

In spite of the social, demographic and technological changes which have taken place during the twentieth century, indigenous Arctic cultures remain vital and resilient. Arctic people live in a variety of landscapes and have differing cultures, economic opportunities and living standards. There are often marked differences between groups living closely geographically. The tables below, for Russia and Canada, and the map of Greenland give examples of census figures and an idea of the mixes which can occur between indigenous and non-indigenous people. For a fuller description of the different peoples of the region, readers are referred to *Arctic Pollution Issues: A State of the Arctic Environment Report* (see Box 2). In spite of the cultural and demographic diversity, there are similarities which span the cultural and geographical divides and provide a background to help understand how changes in the environment can affect people's well-being.

The Arctic population as a whole lives in close contact with its environment. This is especially true for indigenous people, but it also applies to many other inhabitants of the region. Local resources are used throughout the region, and what is harvested or caught is often the most important source of food. The build-up of contaminants in both the plant and animal species in the region therefore represents a major danger of contamination of the human population through the food chain.

In addition to the problems of contaminants threatening the entire region, traditional ways of life have also been severely disrupted by local developments. The rapid growth during this century of the exploitation of natural resources such as timber, oil and gas has often taken place in traditional homelands. This has sometimes led to displacement of indigenous dwellers, as land once used for reindeer herding, fishing and hunting has been taken over for industrial purposes – at a high social cost.

Populations by region and ethnicity in the Arctic area of Russia, 1989 census

People/ Region	Murmansk Oblast	Nenets Auton. Okrug	Yamalo-Nenets Auton. Okrug	Taimyr Auton. Okrug	Sakha Republ. Arctic area	Chukotka Auton. Okrug	Russian Arctic	Russia
Saami	1615	0	0	2	0	0	1617	1835
Enets	4	0	2	103	0	0	109	198
Nenets	176	6423	20917	2446	0	10	29972	34190
Khanty	10	5	7247	3	0	4	7269	22283
Nganasan	5	0	3	849	0	0	857	1262
Dolgan	18	0	14	4939	0	4	4975	5363
Even	10	1	46	34	1793	1336	3220	17055
Evenk	20	27	78	311	1295	54	1775	29901
Chukchi	2	0	11	1	428	11914	12356	15107
Yupik	3	6	7	0	0	1452	1468	1704
Yukagir	3	0	3	0	476	160	642	1112
Selkup	1	1	1530	8	0	0	1540	3564
Chuvan	9	0	0	4	0	944	957	1384
Koryak	5	1	31	16	0	95	148	8942
Ket	0	3	6	11	0	0	20	1084
Mansi	18	1	216	1	0	3	239	8279
Total indigenous	1899	6468	30111	8728	3982	15976	67164	
Total population	1164586	53912	494844	555803	66632	163934	1999711	
% Indigenous	0.16%	12.00%	6.08%	15.64%	5.98%	9.75%	3.36%	

Source: AMAP

now needs to be updated in order to take into account the experience that has been gained. It has been supplemented by different tools addressing issues such as risk identification, the transport of dangerous goods, port areas, and disaster medicine. Use has also been made of guidance developed in the OECD. Sweden, which has always supported APELL, is now starting work on land use planning guidance within the framework of the EU, which we hope can be of use as a long-term preventive instrument.

Even if APELL began by focusing on awareness and preparedness, the emphasis in recent years has increasingly been on the prevention of accidents. This change, which reflects developments in many

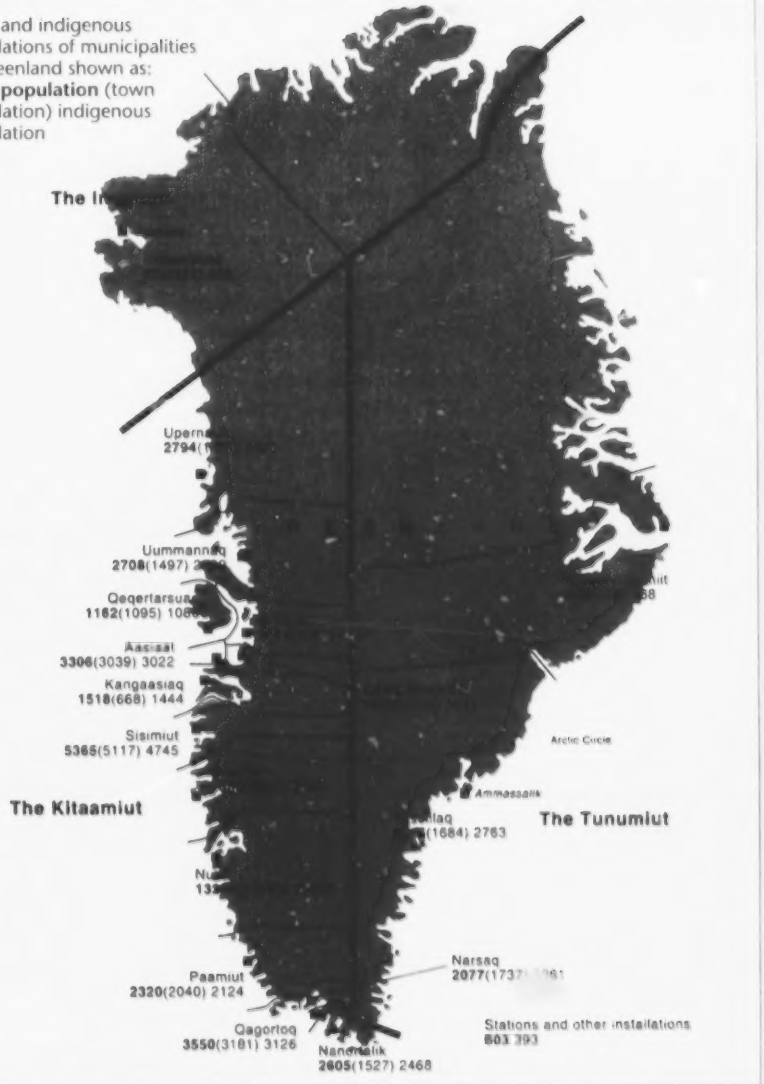
Total and indigenous population of Arctic Canada

Region	Total	Indigenous	% Indigenous
Labrador	2519	1860	73.6
Nunavik	7690	6825	88.8
Baffin	11139	8970	80.5
Keewatin	5832	5170	88.6
Kitikmeot	4018	3526	87.7
Inuvialuit	5666	3850	68.0
Fort Smith	26970	10262	38.1
Inuvik	3127	2448	78.3
Yukon	26024	4440	17.6
Total	92985	47351	50.9

Source: AMAP

Much remains to be learned about the lifestyles of the indigenous peoples of the Arctic region. The great diversity between countries and cultural groups, and between individuals within communities, makes it especially important to understand local contexts when assessing the effects of activities and pollutants on people's well-being. Communication is vital for continuing work in the region, not only because the people of the Arctic have the same right as anyone else to sound information about their environment, but also because they have unique knowledge which may assist our overall understanding of environmental damage.

Total and indigenous populations of municipalities in Greenland shown as: **total population** (town population) indigenous population



countries, should be taken into account in reviewing the APELL Handbook. However, it is of course natural to maintain the aim of always starting by creating awareness and preparedness.

**Member of the UNEP APELL and Joint UNEP/DHA Environment Unit Advisory Committees and chair of the Arctic Environment Protection Strategy/Arctic Council Working Group on Emergency Prevention, Preparedness and Response (EPPR) since the start of these mechanisms for international cooperation. Ulf Bjurman has also been Swedish representative for many years in other international fora dealing with emergency matters (UN/ECE, IMO, OECD, EU, Nordic cooperation, etc.).* ◆

Capacity building in management of chemical accidents in India

V. Srinivas Chary, Administrative Staff College of India, Bella Vista, Hyderabad-500 049, India

Abstract

Increased public awareness, stricter regulations, and a responsive judiciary are among the reasons Indian industry is improving its accident prevention and preparedness capabilities. There is a particular need for proper training and education. With this in mind, the Centre for Energy, Environment and Technology at the Administrative Staff College of India organized a training programme on Management of Chemical Accidents in order to increase awareness and develop skills in accident prevention and preparedness in the chemical process industry. Specific objectives of the training programme, major topics, and issues that emerged are presented.

Résumé

La sensibilisation croissante du public, le durcissement des règlements et le dynamisme du système judiciaire sont quelques-unes des raisons qui ont poussé l'industrie indienne à améliorer ses capacités de prévention des accidents et d'intervention en cas d'urgence. Mais des efforts s'imposent, plus particulièrement dans le domaine de la formation et de l'éducation. Conscient de cette nécessité, le Centre pour l'énergie, l'environnement et la technologie de l'Ecole supérieure d'administration de l'Inde a mis en place un programme de formation sur la gestion des accidents impliquant des produits chimiques, afin d'accroître la sensibilisation et de développer les compétences des professionnels de l'industrie chimique en matière de prévention des accidents et d'intervention d'urgence. L'article présente les objectifs du programme de formation, les principaux thèmes abordés et les enseignements tirés de cette formation.

Resumen

Una mayor toma de conciencia pública, una reglamentación más estricta y un poder judicial sensibilizado son algunas de las razones que han contribuido a mejorar la prevención de accidentes y las capacidades para la preparación en India. Existe una necesidad particular para una formación y educación adecuadas. En esta óptica, el Centro para la Energía, Medio ambiente y Tecnología en la Facultad del Personal Administrativo de India se organizó un programa de formación sobre la Gestión de los Accidentes químicos, a efectos de desarrollar la toma de conciencia e incrementar las competencias para prevenir los accidentes y la preparación en la industria de procesos químicos. Se presentan objetivos específicos del programa de formación, temas principales y asuntos que surgieron.

More than ten years after Bhopal

The rapidly growing Indian chemical industry is playing a vital role in economic development. It accounts for 7 per cent of all factories and 13 per cent of gross industrial manufacturing output. While dye and dye intermediates, bulk drugs and pharmaceuticals are net foreign exchange earners, the chemical industry as a whole is a net importer. A large number of hazardous chemicals and processes are imported without much understanding of the nature of the hazards posed during storage and transportation or during the processes.

Even though the chemical industry is contributing to the rapid economic growth of the country, the health and environmental risks it poses have become a major cause of concern and are attracting public, government and judiciary attention and criticism. The management of risk in the chemical industry is one of the most complex issues Indian society faces today.

Importantly, the accident potential in the chemical industry is attracting attention because of the increased frequency of accidents, the extensive damage they cause, and their cost to organizations and society. More than ten years after the Bhopal tragedy, accident prevention and preparedness capabilities are limited to a few large-scale categories of industry. Lack of proper understanding of potential chemical hazards, and of operations involving chemicals, has led to many serious accidents in the Indian chemical process industries even after Bhopal. It is sheer luck that the impacts of these accidents have been limited to fewer casualties than at Bhopal. However, it is clearly understood that virtually all of these accidents, including the Bhopal tragedy, could have been prevented with proper foresight.

The Bhopal accident and several others all over India have aroused considerable public and government concern to identify, assess and control industrial accidents. Concern over the potential hazards at industrial units handling toxic, flammable or reactive chemicals, and the dire need to protect workers, the general population and the environment, have led the Indian government to make concerted efforts and to enact a number of national statutes on safety, health and the environment. These statutes place emphasis on ensuring occupational safety and health in the workplace through careful initial planning, adoption of control measures, and systematic updating of the skills of personnel and vigilant periodic monitoring of safety status. Some of the important regulations include: the Factories Act of 1948 (amended 1987); the Manufacture, Storage, Import of Hazardous Chemicals Rules of 1989; the Central Motor Vehicle Act of 1988 and Rules of 1989; the Public Liability Insurance Act of 1951; the Environmental Impact Assessment Notification of 1994; and the National Environmental Tribunal Act of 1995.

A new set of Chemical Accidents (emergency planning, preparedness and response) Rules (1996) gazetted recently will enable better coordination planning and preparedness at local level in the event of an accident. The regulations were drafted in line with UNEP's APELL Programme. Most importantly, risk analysis has now received statutory sanction from the Indian government in the Notification of Environmental Impact Assessment, 1994.

In spite of the government's concerted effort to strengthen the regulatory regime for accident prevention, risk management capability in Indian industry is limited to a very few large industrial establishments which call on international consultants. Many large industries, and also many small and medium-sized hazardous industries, do not have a proper understanding of accident prevention and preparedness principles or of risk management tools. There is a lack of knowledge of hazards associated with chemicals, as well as inadequate maintenance, poor safety and pollution control, lack of emergency equipment and of written safety and emergency procedures, and, most importantly, inadequately trained personnel. Moreover, industries do not have systems in place to deal with accidents. There is a general perception of safety as meaning hardware additions like alarms or other devices, with less importance being given to "software options" such as systems and procedures.

The CEET training programme

In the Indian context, increased public awareness, stricter regulations, and a responsive judiciary are making it necessary for industry to change accident prevention and preparedness capabilities in its operations. There is an urgent need for proper training and education of people involved at the various levels of prevention and preparedness. With this in mind, the Centre for Energy, Envi-

tonment and Technology (CEET) at the Administrative Staff College of India (ASCI), Hyderabad, organized a training programme on Management of Chemical Accidents on 16-18 September 1996, with the intention of raising awareness and developing skills in accident prevention and preparedness in the chemical process industry. This skill development through training exercise may strengthen safety management capabilities in the Indian chemical industry and help make it more responsive and proactive. There is general agreement that training has an important role to play in achieving the final objective of risk minimization.

The training programme was supported by the national Ministry of Environment and Forests. Its specific objectives were to:

- increase awareness and capabilities in order to prevent chemical accidents;
- update the knowledge regarding hazards and risks associated with the chemical industry and develop skills in quantitative methods of risk management;
- highlight the technical, managerial and legal issues involved in the management of chemical accidents.

Through this programme an attempt was made to bring about a change in attitudes in the industry by demonstrating that "software" options such as systems and procedures are as important as the "hardware" options.

Some of the major topics covered were: principles of accident prevention and preparedness; fundamentals of toxicology; hazard identification methods; hazard and operability studies (HAZOP); hazard analysis (HAZAN); fault tree analysis; databases on toxic chemicals; consequence analysis (modeling of fire, toxic release, explosion, etc.); human error analysis; on-site and off-site emergency management; issues in transportation of hazardous chemicals; economics of risk management; safety auditing; safety regulation; and insurance auditing.

The training programme was attended by 32 middle and senior managers from large, medium and small-scale industries (petrochemicals, fertilizers, drugs and pharmaceuticals, etc.). Interestingly, representatives from the insurance sector also participated.

Training was given in the form of lectures, case studies, group discussions and computer simulations. The "learner-active" training approach was adapted, so that due emphasis was placed on real-world local conditions. Industry case studies were presented to demonstrate various risk management tools.

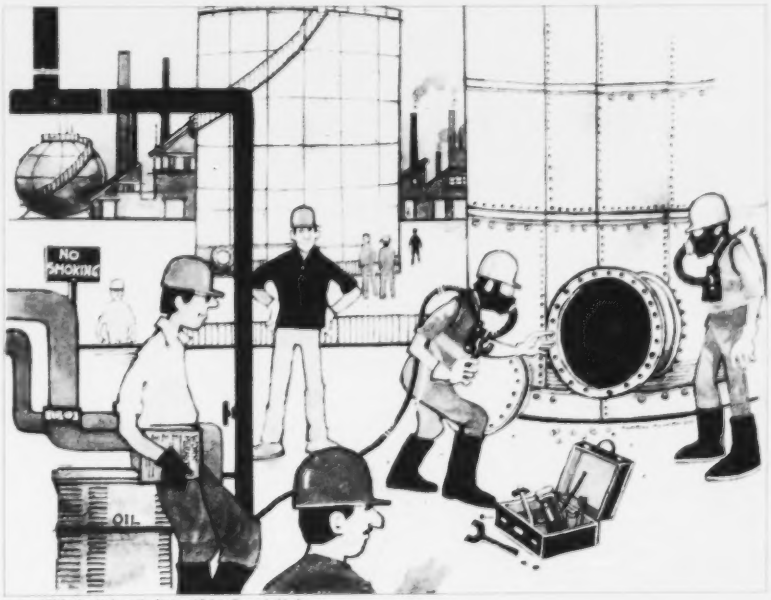
A detailed case study of work on accident prevention and preparedness in the pesticide industry was used to give participants an opportunity to try out the tools they had learned about during the lecture sessions. The case study, which was prepared drawing heavily on UNEP's training manuals, allowed participants to explore some aspects of accident prevention and preparedness for industrial operations, namely identification of major accident hazards, consequence analysis of those hazards, risk mitigation and emergency planning.

Participants also showed considerable interest in consequence modelling. Different consequence analysis software was made available on computer to participants during the programme. Using these tools, participants drew damage distances which were then used in drafting emergency plans.

Several important issues emerged, primarily through feedback from participants:

- There is an immediate requirement for large-scale training of personnel in the chemical industry in the area of risk management. Training should be given to shop-level personnel and to middle- and top-level management.
- Networking of training institutes, R&D centres and industry should be initiated for wider dissemination of state-of-the-art information or technology.
- Participants were of the opinion that training of top management is essential. Without its support and commitment, making safety-conscious decisions would be difficult.
- Organizations like UNEP, which have developed considerable expertise in training top-level people in management of chemical accidents, should support such training programmes, especially in regard to CEOs and senior management.
- Professional methods of training should be adopted. Simulation exercises, group discussions, and case study-based training methods should be used.
- Emergency information on toxic chemicals has to be disseminated widely. Although UNEP Chemicals' (formally known as IRPTC) database is available from the Ministry of Environment and Forests, and from the Government of India and other selected institutes, industry finds it difficult to access the information. Training institutes may become focal points for information dissemination.
- Acceptable levels of concern (LOC) have to be identified and notified by the statutory bodies.
- Since very few institutes offer training in this area, it would be prudent to train some trainers to help cover the wide target population.
- Such programmes should be conducted regularly and more frequently.

◆



source: 1997 calendar from the National Safety Council of India

Management of Industrial Accident Prevention and Preparedness: A Training Resource Package

Management of Industrial Accident Prevention and Preparedness: A Training Resource Package has been produced by UNEP IE as part of a larger inter-agency initiative to provide educators and institutional trainers with up-to-date teaching resource material on key environmental issues in regard to sustainable industrial development.

Within the APELL programme, it was realized quite early on that attention must be paid to the environmental management training needs of the engineers and managers of the future as well as the present. The training resource package was therefore designed to help universities and colleges incorporate industrial accident prevention and preparedness into their undergraduate, graduate and continuing education courses for engineers and managers.

The package contains:

- ideas on how to organize an APELL workshop, and some general ideas on how to be an effective trainer;
- background papers on accident prevention and preparedness;
- a resource package on APELL, containing a primer and a set of transparencies explaining the APELL process;
- references concerning accident prevention and preparedness and some background documents and directories;
- exercises that can be used in workshops and formal curricula.

For further information, contact: UNEP IE, Tour Mirabeau, 39-43, quai André Citroën, 75739 Paris, France. Tel: +33 (1) 44 37 14 50, Fax: +33 (1) 44 37 14 74. E-mail: unepie@unep.fr

Risques industriels : l'intérêt des bases de données sur les accidents

Hubert Baratin, Ministère de l'environnement, Direction de la prévention des pollutions et des risques, Service de l'environnement industriel, Bureau d'analyse des risques et des pollutions industrielles (BARPI), 15 rue de Sévigné, 69426 Lyon Cédex 03, France

Abstract

It is science which lies behind industrial development, and it used to be assumed that a purely scientific analysis of risk would be sufficient to reduce the frequency and seriousness of accidents to a value approaching zero. This has almost been achieved. However, the remaining risks are still perceived by society as being too high. There is, therefore, a need to take account of the body of feedback data which can be extracted from accidents and near-misses, both recent and less so. The development of information technology and of communications, the spread of international cooperation, and increased awareness of common interests have made it possible to compile and constantly update data bases on industrial accidents. This article describes the French ARIA data base and its use.

Résumé

La science a permis l'essor industriel et on a pensé que les approches strictement scientifiques des risques permettraient de réduire la fréquence et la gravité des accidents à des valeurs proches de 0. Cela s'est avéré presque exact mais les risques résiduels sont encore jugés trop élevés par notre société et il convient de tenir compte du retour d'expérience que constituent les accidents ou quasi accidents du passé récent ou plus lointain. Le développement de l'informatique et des moyens de communication, la généralisation des coopérations internationales et la prise de conscience des intérêts communs permettent de mettre en place et de nourrir des bases de données sur les accidents industriels. L'article qui suit présente la base de données française ARIA et son utilisation.

Resumen

La ciencia ha permitido el éxito industrial y se pensó que los enfoques estrictamente científicos de los riesgos permitirían reducir la frecuencia y la gravedad de los accidentes en valores cercanos a 0. Ello resultó ser prácticamente cierto, aunque nuestra sociedad considere que los riesgos residuales son todavía demasiado elevados. Conviene tener en cuenta la experiencia adquirida a raíz de los accidentes o casi accidentes del pasado reciente o más lejano. El desarrollo de la informática y de los medios de comunicación, la generalización de las cooperaciones internacionales y la toma de conciencia de los intereses comunes permiten instalar y alimentar a las bases de datos sobre de los accidentes industriales. El artículo siguiente presenta la base de datos francesa ARIA y su utilización.

La sécurité des personnes et des biens est sans doute la première raison d'être d'un Etat. L'avènement des techniques industrielles engendre de nouveaux risques pour les personnes que l'Etat doit prévenir. Outre cette émergence de nouvelles sources de dangers, le champ des intérêts collectifs à protéger s'élargit. L'eau, l'air, les paysages etc. sont des biens collectifs dont la protection est réclamée par la société. Ces biens sont vulnérables aux agressions technologiques chroniques ou fortuites et l'Etat se doit d'élaborer et de mettre en oeuvre des outils de prévention, de prévision, de réduction des risques.

Ces outils consistent principalement en des dispositions réglementaires ou normatives techniques à l'attention des fabricants et des utilisateurs industriels de techniques et de produits dangereux. Cette première approche du risque technologique est très développée. Elle tend à s'internationaliser en raison de l'unification des marchés mondiaux mais aussi parce que les biens à protéger comme les eaux terrestres ou marines, l'atmosphère et l'ozone stratosphérique, etc. ne connaissent pas de frontière.

Une seconde approche, plus récente, ne vise pas les techniques ou les produits dangereux mais les hommes qui les utilisent. Les Etats interviennent de plus en plus pour que les processus à risque élevé soient mis en oeuvre par des équipes organisées et compétentes, de façon à minimiser la probabilité d'accident.

Une troisième approche consiste à agir sur l'environnement sensible, et en particulier sur les populations, avec deux objectifs principaux. D'une part éviter, en connaissance de cause, une utilisation inappropriée de l'espace au voisinage des installations dangereuses en fixant des distances d'isolement autour de ces installations. D'autre part informer les populations concernées de la nature des risques encourus afin d'optimiser les comportements en cas d'accident. Cette gestion de l'espace a été la première mesure édictée par un Etat (dès 1810 en France) et elle a vite connu ses limites en se heurtant au droit constitutionnel de propriété. Elle connait un regain d'application depuis une décennie grâce à une modification du cadre législatif.

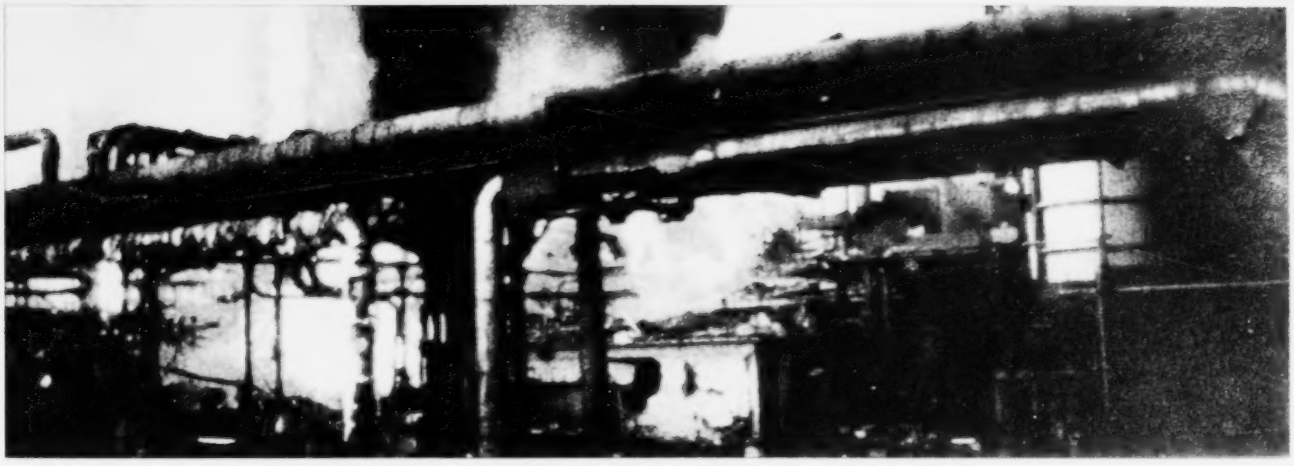
Pour clore cette introduction historique, rappelons que l'attitude actuelle des autorités publiques en France s'est cristallisée à la fin du 18ème siècle autour de la personne du chimiste, médecin, industriel et homme politique Chaptal. Celui-ci est directeur de l'agence révolutionnaire des poudres et salpêtre lorsque deux installations de fabrication de poudre explosent au cours de l'été 1794 à Paris, tuant un millier de personnes. Ses compétences et peut-être une situation politique mouvante font qu'il est néanmoins nommé ministre de l'intérieur 5 ans plus tard. Au nom de l'Etat, il pose publiquement la question de la sécurité des "manufactures". Démissionnaire quelques années plus tard, il rédige la réponse à sa propre question et son rapport est à la base du droit français concernant la sécurité industrielle .

Fondement des mesures prises

Jusqu'à une date récente, en France les mesures prises pour améliorer la sécurité des installations industrielles, que ces mesures concernent la technique ou l'organisation des usines, se fondaient sur le jugement du fonctionnaire chargé de l'application des textes réglementaires, un peu sur le modèle de Chaptal. Le jugement de celui-ci était nourri par son expérience personnelle ou par celle de ses collègues proches, expériences instruites par les incidents ou accidents qu'ils avaient connus. Puis, pour prévenir les accidents rares ou ceux qui laissent peu d'indices pour remonter à leurs causes, les autorités publiques et les industriels eux-mêmes ont financé des études, des essais en laboratoires, des modélisations...

Ces approches ont été fructueuses car le nombre et l' importance des accidents n'ont pas progressé au même rythme que l'industrialisation. Pourtant incidents, accidents et catastrophes industriels ont continué à alimenter l'actualité et à interpeller les responsables de la sécurité : manifestement, tout, et parfois le pire, n'avait pas été envisagé.

Souvent, l'étude détaillée des sinistres graves a montré que l'accident avait été précédé sur le site ou dans d'autres installations semblables par des séquences plus ou moins complètes du scénario. De ces précurseurs d'accidents , voire de ces accidents initiaux restés méconnus, il convenait de



Explosion et incendie dans une raffinerie, MARTIGUES, le 9 novembre 1992

récupérer les enseignements et de les exploiter. Le raisonnement s'est étendu à tous les accidents si l'on admet que chaque événement apporte son lot d'indices, de confirmation d'hypothèses...

Pour être utilisable, cette expérience devait être collectée de façon rationnelle, enregistrée sous une forme aisément restituable. Elle devait devenir collective alors que l'expérience guidant l'agent appliquant les premières lois sur la sécurité de l'environnement était strictement personnelle. L'informatique offrait des moyens performants pour organiser le retour d'expérience. Les industries aéronautique et nucléaire qui devaient affronter les réactions passionnelles de l'opinion avaient défriché la voie.

Le retour d' expérience est sans doute la voie d' étude du risque la plus pragmatique, la moins polémique et la plus convaincante, contrairement aux approches théoriques qui sont toujours l'objet de querelles d'experts ; il se fonde sur des faits qui font rarement l'objet d'interprétations opposées.

Le retour d'expérience ne s'affranchit à priori d'aucun élément d'une situation industrielle (technique, facteur humain, environnement...) alors que l'approche théorique est réductrice, les "choses étant égales par ailleurs".

Mais l'extrapolation du retour d'expérience est délicate et pour cela, l'accident devra être analysé, éventuellement reconstitué en laboratoire, puis théorisé afin de déterminer les limites de sa pertinence. Le retour d'expérience conforte les modélisations et les expériences de laboratoire qui à leur tour peuvent conduire à prêter une attention accrue à des phénomènes auparavant négligés au cours des enquêtes après accident. Retour d'expérience après accident, expérimentation et modélisation s'enrichissent mutuellement.

Base de données ARIA (Analyse, Recherche et Information sur les Accidents)

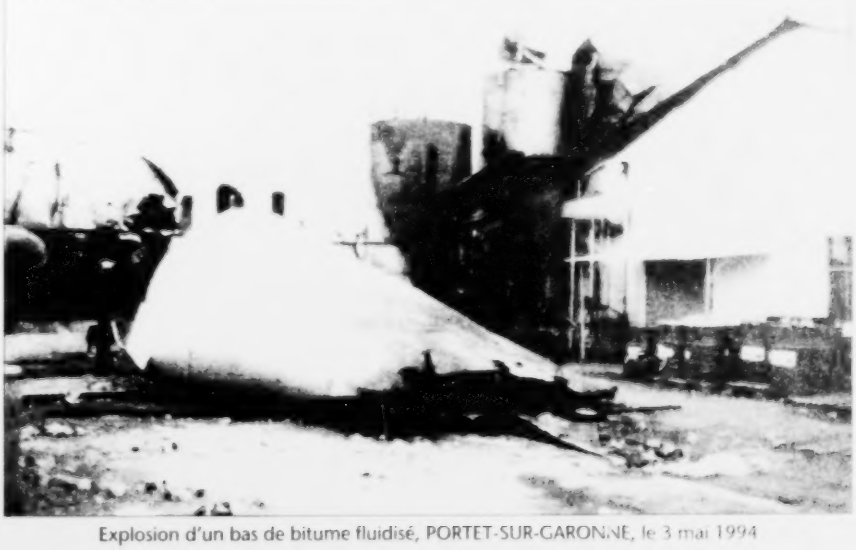
La mise en place de la base données ARIA s'est précisée à l'occasion d'un sinistre important survenu dans les installations portuaires de Lyon en juin 1987. Un incendie se déclare dans un dépôt pétrolier pendant des travaux de maintenance à proximité des bacs. Dans les premières minutes, plusieurs réservoirs d'hydrocarbures liquides sont projetés à plus de 200 mètres d'altitude entraînant une désorganisation des secours et une extension anormalement rapide du sinistre. Quelques heures plus tard, un "boilover" se produit sur un bac de gasoil alors que ce produit n'était pas sensé présenter ce risque. On déplorera deux morts et quinze blessés. Les enseignements recueillis au cours de l'enquête sur l'incendie des bacs d'hydrocarbures et l'analyse des conditions d'intervention ont conduit à une refonte complète des textes réglementant l'exploitation des dépôts pétroliers. On s'est rappelé que des sinistres semblables avaient eu lieu et que les mesures de sécurité applicables ne permettaient pas de les prévenir.

Une première tentative de mise en place organisée du retour d'expérience s'est faite au sein d'une association des industriels et de l'administration. Mais la réticence des industriels pour communiquer leurs expériences malheureuses, vécues comme des échecs, n'a pas permis de recueillir un fond d'information conséquent et exploitable. Le ministère chargé de la protection de l'environnement a donc décidé de se doter des moyens matériels et humains nécessaires à un retour d'expérience organisé et utilisable. C'est ainsi qu'ont été créés le Bureau d'analyse des risques et des pollutions industrielles (BARPI) et sa base de données ARIA.

A la même période, d'autres pays et d'autres organismes ont eu les mêmes réflexions. Ainsi, l'OCDE (Organisation pour la coopération et le développement économiques) a recommandé à ses pays membres d'échanger les informations sur les accidents chimiques. Le Canada a été un pays moteur et s'est beaucoup impliqué dans l'élaboration des modalités de cet échange et notamment dans la rédaction et la traduction du formulaire de notification des accidents. Il a été décidé que les informations ainsi notifiées seraient enregistrées sur la base ARIA.

De même, pour l'application de la convention sur les effets transfrontières des accidents industriels adoptée à Helsinki le 17 mars 1992, l'ONU-CEE (Commission économique pour l'Europe) a retenu la base de données ARIA et, moyennant un ajout, le formulaire de notification venant d'être créé. Cette convention prévoit en effet la notification des accidents concernés et l'échange d'informations, notamment sur l'expérience acquise en matière d'accidents industriels (article 15 et annexe XI).

Le système informatique d'ARIA est composé



Explosion d'un bas de bitume fluidisé, PORTET-SUR-GARONNE, le 3 mai 1994

d'un serveur et d'une dizaine d'ordinateurs. Le logiciel est une adaptation d'un logiciel existant. Les informations sont structurées selon une logique descriptive qui est reprise dans la Fiche de notification, formulaire "papier" de saisie des informations.

Les éléments fournis sont les suivants :

- Date et lieu de l'événement.
- Etablissement et son environnement (localisation, situation administrative).
- Principaux produits impliqués (quantité présente sur le site, quantité impliquée, forme du produit et conditions de mise en oeuvre – température, pression, concentration, conditionnement).
- Installations et équipements en cause (nature des installations, situation administrative, équipements en cause, procédé, capacité, effectif, organisation du travail...).
- Evénement (typologie de l'événement, principales phases du déroulement de l'événement, situation météorologique si nécessaire, prise en compte de l'événement, état de l'installation lors de l'événement).
- Intervention et secours (conditions d'alerte, principaux points de chronologie, moyens d'intervention humains et matériels, portée géographique et durée des mesures prises, difficultés particulières d'intervention).
- Conséquences (conséquences humaines, dommages matériels, privations d'usage, atteintes aux milieux naturels et au patrimoine, à la faune et à la flore, conséquences économiques).
- Analyse des défaillances et des causes.
- Suites, administratives, pénales, techniques telles que la restauration des caractéristiques environnementales initiales, les mesures correctives pour éviter le renouvellement du sinistre.

En tout, la base permet d'utiliser environ 2200 descripteurs complétés par des zones de texte libre pour recevoir toute information spécifique, commentaire ou précision utile.

Cette base de données est exploitée par une équipe de cinq personnes. Elle est opérationnelle depuis février 1993. Elle est consacrée aux incidents et accidents survenant dans des installations industrielles fixes ou assimilées, à l'exception des installations nucléaires. Les accidents impliquant le transport de matières dangereuses sont eux pris en compte. Le niveau de détail des informations retenues et enregistrées sur un accident dépend de son intérêt potentiel en terme de conséquences et d'enseignements que l'on peut en tirer. Les informations sont hiérarchisées en trois niveaux suivant leur fiabilité et leur précision. La phase cruciale est la validation des informations. Ce contrôle se fait à divers stades : tout d'abord, il y a un contrôle de cohérence fait au moment de la saisie et ultérieurement par l'agent spécialisé dans le type d'événement rapporté. En ce qui concerne les accidents qui se produisent en France, les services locaux et les administrations centrales concernés sont régulièrement consultés sur le libellé du résumé (tous les deux mois). Enfin, lorsque ces informations sont restituées à qui le demande, l'attention des destinataires est systématiquement attirée sur la possibilité d'erreur ou d'inexactitude et ceux-ci sont invités à transmettre des propositions de correction.

Le rassemblement des informations sur les accidents qui se produisent en France est systématique depuis 1988. Elle est alimentée à partir des informations fournies par la Protection civile et l'Inspection des installations classées, par les correspondants étrangers du BARPI et par les revues de presse.

A ce jour plus de 11000 événements sont enregistrés, 9000 sont survenus en France et 250 événements enregistrés sont issus des notifications effectuées en application des recommandations de l'OCDE mentionnées plus haut.

ARIA permet des tris multicritères et analyses statistiques portant sur l'un ou plusieurs des 2200 descripteurs de l'événement ainsi que sur le texte du résumé et la sélection puis l'édition des événements ainsi recherchés.

D'autres bases de données sur les accidents ont été développées par des administrations, des services publics ou des organisations professionnelles. Certaines affichent une vocation nettement commerciale. Cela témoigne de l'existence d'une demande. D'autres sont d'un accès réservé. La base MARS mise en place par les autorités européennes et sur laquelle sont enregistrés les accidents notifiés en application de la directive "SEVESO" de 1988 (82/501/CEE) a une vocation très semblable à la base de données ARIA. Les options sont un peu différentes (choix des accidents enregistrés, sources, possibilités de restitution...).

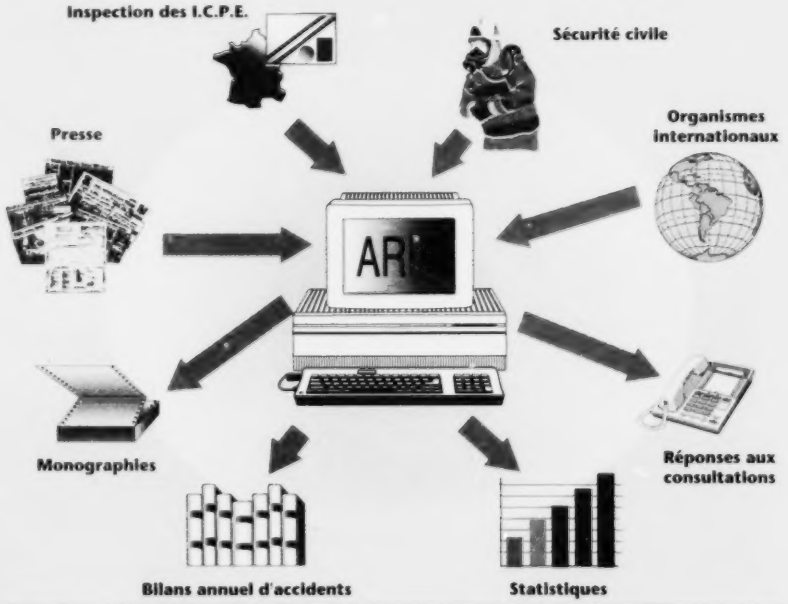
Utilisation de la base de données ARIA

Dans des conditions préservant la confidentialité, tout partenaire public ou privé, aussi bien en France qu'à l'étranger, impliqué dans la prévention des accidents industriels et des pollutions peut accéder aux données par l'intermédiaire du BARPI.

Les informations sur les accidents ou quasi accidents recueillies par le BARPI sont systématiquement mis à la disposition des services élaborant la politique de protection de l'environnement et en particulier des fonctionnaires chargés de l'élaboration des textes. Le plus souvent, il s'agit des textes réglementaires et des normes nationales. C'est ainsi que les descriptions des accidents survenus dans la mise en oeuvre de l'ammoniac, notamment dans les installations de réfrigération, ou dans l'utilisation du chlore ont influencé la rédaction des textes récents sur ces activités. L'analyse détaillée d'une vingtaine d'accidents survenus au cours de synthèse de chimie fine a servi de base à un groupe de travail associant les industriels et l'administration et a fondé un ensemble de 42 recommandations largement diffusé dans les entreprises de chimie (voir encadré).

Cependant, en matière d'environnement, on observe un transfert progressif des compétences nationales vers les instances internationales et le retour d'expérience sert alors à déterminer les positions nationales lors de l'élaboration des textes internationaux (directives, recommandations, conventions...). Les données de la base ARIA ont montré leur pertinence notamment au cours de la révision de la directive "SEVESO". Elles ont permis à la France d'obtenir un consensus sur la nécessité d'informer le public, de limiter l'urbanisation, d'appliquer la directive à certaines activités dangereuses mais non soumises au texte de 1982. Autre exemple : les pollutions acci-

La base de données ARIA



dentelles des eaux recensées par le BARPI sont examinées par les experts français participant aux travaux de la Commission internationale pour la protection du Rhin.

La base ARIA est régulièrement sollicitée par les services régionaux et locaux chargés d'une part de l'élaboration des règles particulières d'exploitation auxquelles est subordonnée l'autorisation d'exploiter des installations industrielles dangereuses, et d'autre part de l'inspection de ces installations.

Autre utilisation des informations de ARIA : la réglementation française impose à l'industriel d'examiner dans un dossier spécifique (étude des dangers) tous les risques induits par ses activités et de prendre les mesures préventives nécessaires et suffisantes. Les services locaux examinent les dossiers des industriels à la lumière des informations d'ARIA sur des accidents dans des installations semblables. Ces études doivent être actualisées pour prendre en compte le progrès des connaissances et notamment du retour d'expérience. Les éléments statistiques fournis par la base de données servent à élaborer des programmes d'actualisation, par exemple en tenant compte des fréquences d'accidents et de leur gravité dans certains secteurs industriels ou au cours de certaines phases particulières de l'exploitation des installations (par exemple au cours des travaux de maintenance).

La phase d'inspection des installations se prête aussi à une exploitation des informations sur les accidents. L'examen des équipements en situation de fonctionnement permet une confrontation avec les données sur les causes, l'origine, les circonstances, etc. L'inspection est aussi un moment privilégié dans les relations entre les autorités locales et l'industriel, car l'évocation des accidents du passé a une réelle puissance didactique et incitative qui favorise la mise en oeuvre ou l'optimisation de mesures techniques ou organisationnelles.

En France, le Ministère de l'Environnement a d'emblée estimé que les informations enregistrées sur ARIA avaient un intérêt dépassant le cadre administratif. Il a décidé de mettre l'essentiel des informations à disposition de tous de deux façons. La première consiste à fournir à qui le demande une liste de résumés d'accidents (en général une cinquantaine lorsque cela est possible) et des éléments de comparaison statistique répondant aux critères défini par le demandeur. A ce jour, plus de 1000 études ont été réalisées pour des industriels, des bureaux d'ingénierie, des administrations, des centres de recherche et des étudiants, des assureurs ou de simples particuliers. Quelques consultations proviennent de pays tiers : toutefois à ce jour, les réponses sont faites exclusivement en langue française. Il serait bon qu'un organisme international puisse offrir aux autorités étrangères aux moyens limités une traduction des informations issues du retour d'expérience français.

A noter que les organismes de recherche utilisent ces données pour définir des axes prioritaires de travail cités précédemment (travaux de modélisation, études des défaillances humaines, élaboration de stratégies de communication par les différents acteurs en matière de risques industriels...).

Le second mode de diffusion des informations de la base de donnée ARIA est la presse spécialisée. Tous les deux mois, dans une revue spécialisée dans le risque industriel et lue par plus de 50000 personnes, le BARPI publie une liste d'accidents récents survenus en France ou dans le monde. En outre, plusieurs fois par an, le BARPI rédige pour une autre revue s'adressant au même lectorat un article sur un thème donné et illustré par une liste d'accidents de référence (par exemple, les derniers articles ont été consacrés aux accidents lors de travaux par points chauds, aux statistiques incendie, aux dispositifs de rétention des produits polluants, aux accidents consécutifs aux défaillances d'automatismes). Les informations ainsi diffusées sont reprises dans certains colloques spécialisés et on peut raisonnablement penser qu'elles sont aussi utilisées dans les enceintes privées où sont élaborées les politiques et les règles de sécurité des entreprises industrielles.

Perspectives et conclusion

La collecte des informations, leur analyse, leur enregistrement sont particulièrement "chronophages" et nécessitent une connaissance approfondie des processus industriels, des cultures d'entreprises et dans certains cas de la psychologie des acteurs (opérateurs industriels, intervenants dans les secours, population environnante). L'analyse de certains types de sinistres ne peut être raisonnablement entreprise que par des spécialistes (le BARPI fait souvent appel aux compétences de l'Institut National de l'Environnement Industriel et des Risques (INERIS).

Le besoin de travailler sur des populations homogènes d'accidents conduit à recueillir des informations précises sur des accidents survenus dans d'autres pays. Cela justifie une collaboration étroite entre les services traitant du retour d'expérience et une mise en réseau des services est souhaitable.

Il serait bon de collecter les informations détenues par d'autres organismes en charge de l'intérêt public. Par exemple, les services de justice fondent leurs décisions sur des rapports d'experts de haute qualité technique. Aujourd'hui, ces rapports éclairent seulement le juge alors que leur intérêt didactique est général. A noter que la justice sollicite rarement les bases de données mises en place par les autorités chargées de la prévention. Cette ignorance réciproque n'est plus de mise.

La saisie détaillée des accidents industriels dans les bases de données permet d'organiser et d'utiliser de façon rationnelle le retour d'expérience et de constituer à peu de frais un des axes essentiels de l'étude du risque, de sa prévention et de sa mitigation. Ce retour d'expérience peut et doit devenir plus pertinent encore en approfondissant les analyses. Cela passe par la collaboration de tous, et principalement celle des acteurs et des intervenants dans un accident. Cependant la recherche des responsabilités, notamment pour l'indemnisation des victimes, ne favorise pas la transparence des entreprises en cas d'accident. Le sens donné à l'échec dans nos sociétés n'est pas non plus favorable. Mais la pratique scientifique et dépassionnée du retour d'expérience, sa pertinence, son universalité et sa mise en oeuvre relativement peu coûteuse permettront de lever ces obstacles d'ordre psychologique. ◆

Un exemple de retour d'expérience : la chimie fine, recommandations résumées

Procédé

- Dossier de sécurité rassemblant tous les éléments relatifs à la sécurité.
- Attention particulière aux procédés utilisant ou produisant des substances instables, aux réactions à cinétique rapide, aux réactions produisant de grandes quantités de gaz.
- Détermination préalable du domaine de sécurité du procédé et des paramètres importants pour la sécurité.
- Identification des phases de mises en sécurité d'un procédé. – Formalisation d'une procédure d'approbation d'un procédé.
- Analyse préalable des modifications même minimes du procédé.
- Echange et validation d'information entre un façonnier et un donneur d'ordre.

Conception

- Possibilité de faire face à un emballement de réaction.
- Calcul des disques de rupture et des soupapes de sécurité.
- Protection contre les entraînements de produits dangereux dans les organes de sécurité.
- Réduction de l'utilisation de verrerie.
- Eloignement des points de fuite potentielle de fluides inflammables des points chauds.
- Vérification préalable du matériel réutilisé.
- Maîtrise des débits et quantités de réactifs.
- Maîtrise des rejets accidentels par des équipements de récupération, de neutralisation...
- Visualisation du fonctionnement des organes de sécurité.
- Recherche de la compatibilité entre les fluides caloporteurs et les produits de fabrication.
- Optimisation des dispositifs d'agitation.
- Possibilité de verrouillage des dispositifs de sécurité.
- Exploitation des installations.
- Réception des travaux de maintenance en présence des utilisateurs.
- Sélection des sous-traitants sur des critères incluant la sécurité.
- Contrôle préalable des matières premières.
- Chargement des réactifs inflammables sous atmosphère inerte.
- Nettoyage des installations.

Facteur humain

- Formation spécifique à la sécurité.
- Parrainage des nouveaux opérateurs par des ouvriers expérimentés.
- Clarté des consignes.

APELL Case Studies

Introduction

In 1986, UNEP suggested a series of measures to help governments, particularly in developing countries, minimize the occurrence and harmful effects of chemical accidents and emergencies.

As a follow-up to this work, the UNEP Industry and Environment centre (UNEP IE), in collaboration with industry, developed a Handbook on Awareness and Preparedness for Emergencies at Local Level (APELL), designed to assist decision-makers and technical personnel in improving community awareness of hazardous installations and in preparing response plans, should unexpected events at installations endanger life, property or the environment. For readers who are not familiar with the background to APELL, the process is summarized below.

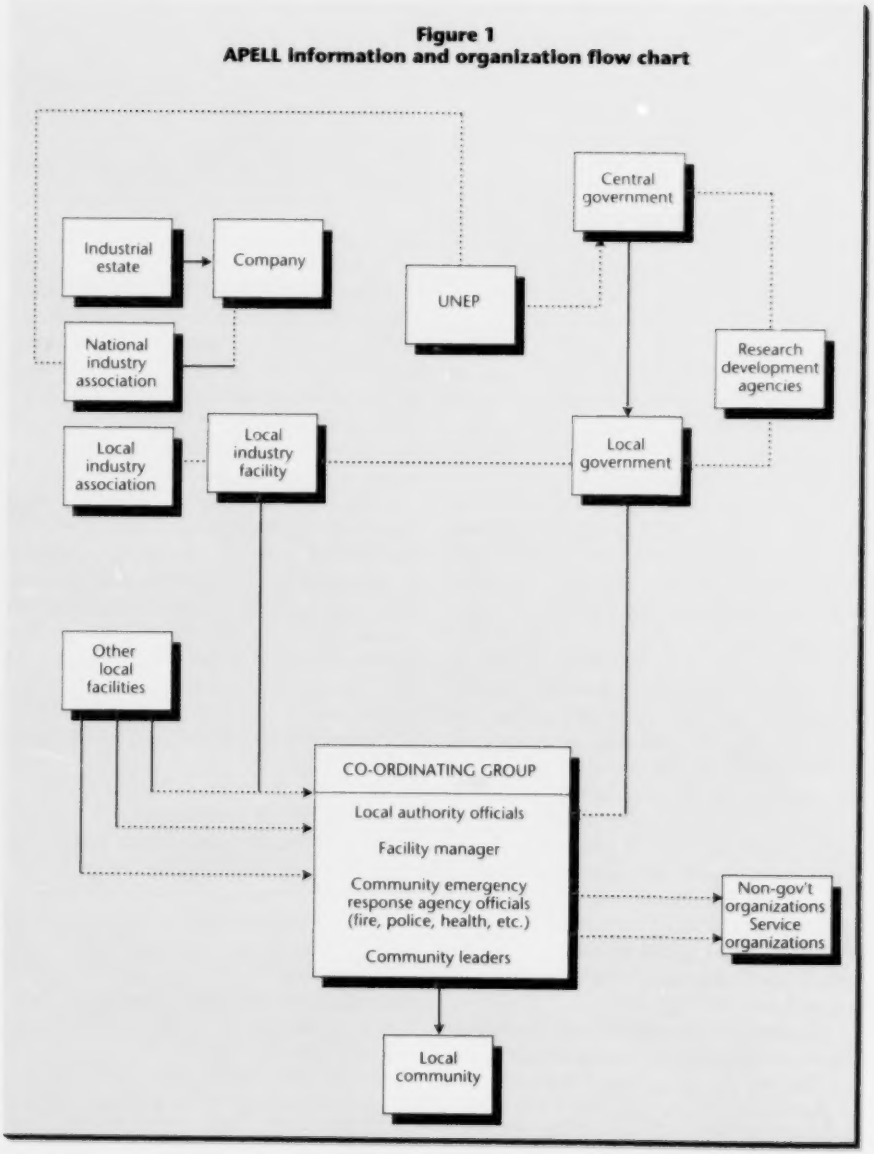
APELL addresses all emergencies related to any industrial or commercial operation with potential for fire, explosion, spills or releases of hazardous materials. The programme has two main goals:

- to create and/or increase community awareness of possible hazards involved in the manufacture, handling and use of hazardous materials, and of steps taken by authorities and industry to protect the community from them;
- to develop, on the basis of this information, and in cooperation with the local communities, emergency response plans involving the entire community should an emergency endangering its safety arise.

Most industrial facilities have a responsibility to establish and implement a "facility emergency response plan", and there may also be national government emergency plans or programmes in place. The APELL process uses all of these existing elements to build a coordinated single plan that will operate effectively at the local level, which is where first response efforts are critical.

In order for local authorities and local leaders to play an effective role in the process, there must be close and direct interaction with representatives from industrial facilities in their local area. APELL addresses the need for interaction between local government and industry. **Figure 1** shows sche-

Figure 1
APELL information and organization flow chart



matically how industry representatives and local authorities/leaders can form a Co-ordinating Group. The Co-ordinating Group is the mainspring of the APELL process, forming a bridge between the community, local authorities and industry.

Based on experience, a ten-step approach for implementation of APELL has been devised to lead to a useful and effective integrated community emergency response plan. These ten steps are shown in the flow chart in **Figure 2**.

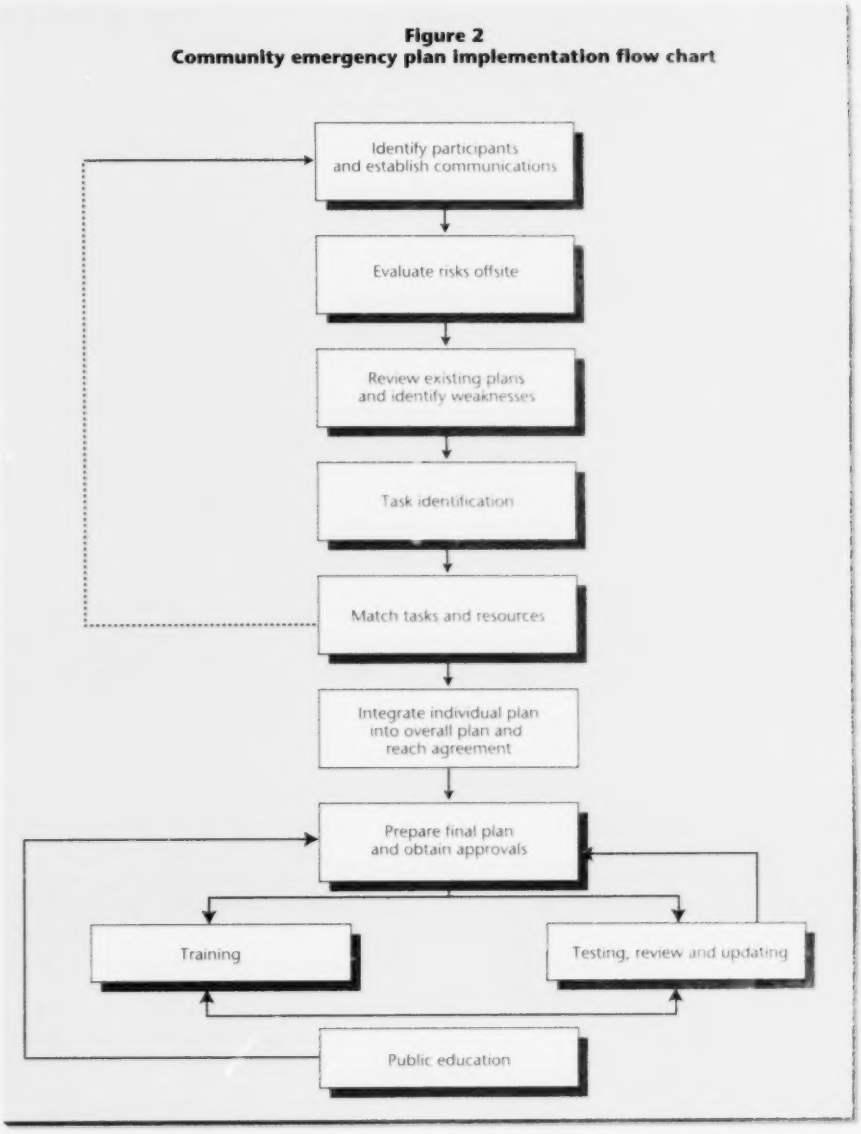
Since APELL started in late 1988, requests have been received from all around the world not only for the Handbook but also for feedback on efforts being made to implement the programme. The eve of the programme's tenth anniversary seemed an opportune moment to respond to such requests, and feedback is provided in this section in the form of Case Studies, presented in alphabetical order.

These are examples of the APELL process in action, describing implementation of the now well established programme in six different places. This has meant implementation in six very different contexts, as all countries differ in culture, value systems, community infrastructure, response capabilities and resources, and legal and regulatory requirements.

These Case Studies are a clear demonstration of the flexibility of the APELL process, which aims neither to provide a unique model for accident prevention and preparedness nor to impose actions to be taken. In each case the APELL objectives remain unchanged, yet the mechanics of the operation change from place to place and are adapted to local conditions and requirements.

For further information, contact: Ms Janet Stevens, Coordinator APELL programme, United Nations Environment Programme, Industry and Environment Centre, Tour Mirabeau, 39-43, quai André Citroën, 75739 Paris Cedex 15, France. Tel: +33 (1) 44 37 14 50, Fax: +33 (1) 44 37 14 74, E-mail: unepie@unep.fr ◆

Figure 2
Community emergency plan implementation flow chart


Identify participants and establish communications
Evaluate risks offsite
Review existing plans and identify weaknesses
Task identification
Match tasks and resources
Integrate individual plan into overall plan and reach agreement
Prepare final plan and obtain approvals
Training
Testing, review and updating
Public education

The development of UNEP's APELL programme in Shanghai

Yang Sen, Director, Shanghai Municipal Defence Office, Fu-Xing Middle Road 593#, 200020 Shanghai, People's Republic of China

Abstract

A paragraph on the APELL programme in Shanghai was included in the entry for the People's Republic of China in APELL Worldwide, *published by UNEP IE in December 1995. This article gives a fuller history of APELL in Shanghai up to the end of 1996; draws conclusions about the lessons learned; and details plans for further development of the programme.*

Résumé

Le manuel APELL Worldwide *publiée par le PNUE IE en décembre 1995 comprend, sous la rubrique de la République populaire de Chine, un paragraphe sur la mise en oeuvre du programme APELL à Shanghai. L'article qui suit donne un historique complet de l'application du programme APELL à Shanghai jusqu'à la fin 1996 et les conclusions sur les leçons tirées de cette expérience ; il décrit en détail les projets d'extension future du programme.*

Resumen

Se incluyó un párrafo sobre el programa APELL en Shanghai en la entrada para la República popular de China en APPEL Worldwide, publicada por el PNUMA -IMA en Diciembre de 1995. Este artículo presenta una historia completa de APELL en Shanghai hasta fines de 1996; extrae conclusiones sobre la experiencia adquirida y detalla planes para continuar el desarrollo del programa.

Background

Shanghai is a city in which industry and commerce are highly developed. In particular, it has a large chemical industry. It was therefore appropriate that UNEP's APELL programme should be applied there, after its national introduction in China during 1987-88. On 5 July 1991, the municipal government issued a local regulation, the "Shanghai City Chemical Accident Rescue Measure" (hereafter referred to as "the Measure"), which provides the framework for chemical accident preparedness and response. This is very much along the lines recommended in the APELL process, emphasizing the importance of cooperation between industry and government and of the involvement of the local community. Since 1991, the municipality has worked with industry to fulfil the targets set in the Measure.

Achievements

Also in 1991, the city established a chemical emergency relief team consisting of experts from municipal and local chemical accident committees.

Over the next two years a hazard identification and evaluation exercise was conducted for all the chemical installations in the city, i.e. those where hazardous materials are manufactured, stored or used. This process resulted in the identification of several hundred Major Hazard Units (MHUs). The basic information has since been kept under review, to make sure it is kept up-to-date. MHUs are required to make plans for accidents and emergencies.

The Shanghai Civil Defence Office (SCDO) subsequently issued several regulations in support of the Measure, which were designed to improve awareness of the law and safety performance within the MHUs. SCDO and the county (local) civil defence offices (CDOs) enforce the regulations by a system of both regular and "spot" inspections. In particular, a "Four Check" activity is organized every summer. This comprises: "Check the applicable regulations; check the equipment; check the accident rate; and check the preparedness measures." The county CDOs organize frequent inspections of the hazardous units within their areas and issue "solve the problem sheets" wherever deficiencies are found. Over 100 such sheets have been issued since 1993. The CDOs then work with the units to help them improve. This approach has been found to result in improved safety and fewer accidents.

The SCDO has set up a chemical rescue command system and a supporting communications network. It has recently invested in a cable and radio-call communications system. This links the various municipal government departments with the chemical installations, and also links Shanghai both to its county emergency offices and to the national emergency office in Beijing. Each county CDO has been required to establish a chemical rescue group and rescue organization. This includes a 24-hour alarm centre linked to fire and police alarm centres.

At the end of 1992, Shanghai began to train rescue specialists and also to provide special training for other personnel. About 1500 people have been trained so far. Every year training is given to those who will have roles to play in the event of an accident – factory managers and safety officers, civil defence and environmental protection staff, and first responders. In cooperation with the local Institute of Occupational Health, courses have been held for chemical industry site medical staff concerning on-site medical treatment of chemical casualties.

SCDO has also organized a system for keeping municipal and county emergency plans under review, in order to carry out a process of constant improvement. Emergency drills have been carried out, including the simulation of an emergency at night on 17 December 1993. The scenario was a chemical accident in the Chlorine-Alkaline Chemical Company. Several hundred first responders took part in this drill. In July 1994, the Asian Development Bank supported a drill based on the scenario of leakage of a hazardous chemical from a truck on the Nanpu Bridge.

From the early stages, emphasis was put on the importance of informing the population. Many different methods have been employed. Several local government departments cooperated to edit and print hundreds of thousands of brochures for distribution to the city's residents. SCDO made an APELL video and teaching materials. Television films on the subject have been produced.

An annual "Chemical Rescue Education Day" has also been instituted, and chemical emergency preparedness has become the subject of TV and other quiz shows. In 1994, SCDO together with the Education Department and the Youth Newspaper organized "the Middle School Students' Civil Defence and Chemical Emergency Rescue Knowledge Contest" and the Middle School Students' Sports. SCDO estimates that about 200,000 middle school children in 100 schools receive some anti-disaster education every year

Each county civil defence office has now installed a chemical emergency education station, where many different kinds of public education activities are conducted. These have included live theatre shows as well as video displays.

Shanghai's emergency plans have received real-life tests on several occasions. In July 1993, SCDO and the Quinpu County CDO worked together with staff from environmental protection, and the city's fire and transport departments, to deal with the leakage of hazardous materials from an overturned vehicle. In January 1995, Huangpu CDO coordinated police, health and gas utility departments to cope with a leak from an underground gas pipe. On both occasions the plans worked well and quickly and damage to people, property and the environment was avoided.

Lessons learnt

Perhaps the most important lesson learnt has been the vital importance of encouraging the development of response capacity within the installation itself. It is characteristic of chemical accidents that they happen very quickly and can have very

serious consequences, both on- and off-site. So chemical installations must have good on-site emergency plans, trained personnel, and the right equipment to deal immediately with the emergencies which may arise.

Therefore, it is obviously also important that emergency planning and preparedness should be based on good science and technology. There are many hazardous chemicals with many different properties, singly and in combination. They require different methods to counter their effects, and sometimes different skills and equipment. There is a need for a chemical rescue centre to act as a Centre of Excellence and to give advice in case of emergency.

Coordination and cooperation by all the organizations concerned are indeed as important as the APELL Handbook says they are. Shanghai has succeeded in bringing the chemical industry together with all the departments of municipal government which are involved in chemical accident preparedness and response. The experience of working together on preparedness planning has meant that everyone has united to deal with real-life problems when they do arise.

Finally, improvement of public awareness is basic to a successful chemical rescue programme. Correct action in the event of a chemical emergency saves lives and prevents injury.

Future plans

SCDO has identified the following main tasks for the future:

- improve the laws and regulations governing chemical safety;
- continue to improve the management of individual functions within the chemical accident preparedness and response field, and also overall organization and coordination;
- continue to build local (county-level) disaster response capacity and improve the availability of expertise and equipment;
- enforce safety supervision of hazardous materials transportation by road and water;
- establish an APELL information and training centre to help promote APELL not only in Shanghai but throughout China.

◆

Proceso APELL Barranquilla, Colombia

Barranquilla APELL Group, President Group, Asociacion Nacional de industriales(ANDI), Via 40 # 36, 135 local 103, Antiguo Edificio de la Aduana, Barranquilla, Colombia

Abstract

This case study describes the implementation of the APELL process in the city of Baranquilla, Colombia, after its revival in 1995. Enterprises from the chemical sector were invited to join the programme and activities were initiated with the local emergency committee and fire brigades. The case study includes a detailed description of an emergency drill in a chemical plant.

Résumé

Cette étude de cas décrit la mise en oeuvre du programme APELL dans la ville de Baranquilla, en Colombie, après un nouveau lancement, en 1995. Les entreprises du secteur chimique ont alors été invitées à se joindre au programme et des activités ont été organisées avec le comité local d'intervention d'urgence et les brigades de pompiers. L'étude de cas comprend également la description détaillée d'un exercice d'intervention d'urgence dans une usine de produits chimiques.

Resumen

Este estudio de caso describe la puesta en aplicación del proceso APELL en la ciudad de Barranquilla, Colombia, después de su resurgimiento en 1995. Se invitaron a las empresas químicas a unirse al programa y se iniciaron actividades con el comité local de emergencias y brigadas de incendios. El estudio de caso comprende una descripción detallada de una perforación de emergencia en una planta química.

Informe de actividades año 1995

Durante el primer semestre del año 1995 el Proceso, estuvo prácticamente inactivo, debido a la desinvinculación del Señor Pablo Montalvo y María Silvina Sosa, quienes se venían desempeñando como Coordinador Técnico y Comunicadora, respectivamente. En el mes de mayo de 1995 se nombró como Coordinadora del Proceso a Olga Lucía Sarria de Slebi.

Una vez restructurado el Proceso, se reiniciaron sus actividades. Se enviaron cartas de invitacion a afiliarse al Proceso a varias empresas del sector químico de la ciudad. Posteriormente se visitaron las siguientes empresas:

- Cynamid Barranquilla S.A.
- Shell Colombia S.A.
- Mobil de Colombia S.A.
- Terpel del Norte S.A.
- Ralco S.A.

En el mes de octubre 1995, se vinculó al Proceso la empresa Productos Quimicos Panamericanos.

Se organizó conjuntamente con los miembors del Comite Local de Emergencias la Tercera Caravana de Seguridad, con motivo de la celebración del Dia Internacional de la Prevencion y Atencion de Desastres, la cual se realizó el 11 de octubre de 1995, çontando con la participación de las Brigadas Industriales de las empresas afiliadas al Proceso APELL.

Se elaboró el cronograma de visitas del Cuerpo de Bomberos a las industrias.

Se organizaron, conjuntamente con la Secretaria de Educación del Distrito, varias conferencias dirigadas a docentes y estudiantes de diferentes planteles educativos de la ciudad de Barranquilla, acerca de las medidas de prevención con sustancias como el gas y la gasolina y como evitar la formación de fuego.

Se reinició la preparación del Simulacro de Emergencia por Escape de Cloro, llevándose a cabo las siguientes actividades:

- Se llevaron a cabo varias reuniones con los miembros de los Comités del Proceso y Alfonso De Oro, Jefe de Seguridad de la empresa Triple A, con el fin de reanudar los contactos realizados y poner en marcha la preparación del Simulacro.
- Una vez confirmada por parte de la Triple A, su deseo de realizar el Simulacro en la Planta de Tratamiento de Aguas, se definieron, nuevamente, las Entidades de Apoyo a participar en el evento y se prosiguió a realizar los contactos pertinentes con cada uno de sus dirigentes, con el fin de involucrarlos en el ejercicio a realizarse.
- Posteriormente, se establecieron las funciones y responsabilidades para cada Entidad, las cuales fueron estudiadas por cada uno de los interesados, con el propósito de lograr una correcta actuación en la atención de la Simulación de la Emergencia.
- Asimismo, se realizaron reuniones con todas los participantes y se definieron los recursos tanto humanos, como materiales, que aportarían cada uno en la realizacion del ejercicio.
- Se reconfirmó el area en donde se desarrollaria el ejercicio del Simulacro, para lo cual se hicieron varias visitas a la Planta del Acueducto.
- Igualmente, se hizo un recorrido con los representantes de las Brigadas Industriales y Entidades de Apoyo a participar, con el propósito de hacer un reconocimiento del Sector y definir la Locali-

Evaluación simulacro de emergencia por escape de cloro Planta del acueducto de Barranquilla, Noviembre 29 de 1995

Finalmente después de una serie de reuniones previas, organizadas bajo la coordinación del Proceso APELL, se llevó a cabo el simulacro de emergencia por escape de cloro, cuyos resultados fueron satisfactorios, teniendo en cuenta que uno de los objetivo de estos ensayos es preparar a los Grupos de Apoyo y Brigadas Industriales y evaluar el desempeño de las actividades de los mismos, con el fin de corregir las desviaciones una vez se compare lo programado con lo ejecutado, logrando así disminuir el impacto de una emergencia real de éste tipo.

Entidades y empresas participantes

- Cuerpo de Bomberos
- Defensa Civil
- Cruz Roja
- Dasalud
- Distrisalud
- Secretaria Distrital de Transito y Transporte
- Policía Nacional
- Escuela de Policía Antonio Nariño
- Instituto de Seguros Sociales
- Servicio Nacional de Aprendizaje. Sena
- Oficina de Prevención y Atención de Desastres del Distritocorporación Autónoma Regional. Cra
- Depto Administrativo Distrital del Medio Ambiente. Dadima
- Triple A
- Bayer de Colombia S.A.
- Colterminales S.A.
- Dupont de Colombia S.A.
- Lloreda Grasas S.A.
- Monomeros Colombo Venezolanos S.A.
- Pizano S.A.
- Productos Químicos Panamericanos S.A.
- Promigas S.A.
- Química Nalco de Colombia S.A.
- Quintal S.A.
- Rohm and Haas Colombia S.A.

Cronograma General

09:05 Se informa sobre el escape de cloro en el interior de la Planta del Acueducto.

09:06 Seguridad recibe la información, evalúa el evento y se comunica con la Planta para dar la alarma general.

09:07 Brigadistas del área se apersonan de la situación.

09:09 Se le comunica la emergencia al Cuerpo de Bomberos.

09:10 Se despacha la máquina No. 18, con 5 unidades.

09:15 Se informa que la emergencia por escape de cloro ha sido controlada.

09:16 Se desplaza y controla la nube de cloro a base de agua en neblina.

09:18 Se hace un llamado a la Estación La Loma para que despachen la máquina No. 6 para que de apoyo a la máquina No. 18.

09:22 Se hace presente la máquina No. 18 en el lugar de la emergencia.

09:23 Se activa la red GAT-APELL y se informa a los organismos de seguridad y a las empresas pertenecientes al grupo APELL, que la emergencia de escape de cloro ha sido confirmada y que se requiere su presencia en el lugar.

09:24 Se hace presente la ambulancia del Hospital de Soledad.(DASALUD)

09:25 Llega el personal de la Escuela Antonio Nariño, para acordonar el área.

09:26 Llega la máquina No. 6, proveniente de la Estación La Loma, con 5 unidades.

09:27 Se trasladan al Hospital de Soledad varios pacientes intoxicados y afectados por el escape de cloro.

09:28 Llega la ambulancia de DISTRISALUD, con 4 unidades.

09:29 Se actúa con chorro de neblina para bajar la nube de y evitar la contaminación

09:30 Se hace presente la ambulancia de Rohm

The APELL process in Barranquilla, Colombia: evaluation of an emergency drill in a chemical plant

After a series of meetings organized by the APELL Co-ordinating Group, the emergency drill for a chlorine leak was eventually carried out on 29 November 1995 at the Planta de Acueducto in Barranquilla. Its results were satisfactory, taking into account the fact that one of the aims of these exercises is to improve the preparedness of the emergency services and the industry emergency groups and to evaluate their performance. By comparing what actually happens with the original plan, problems can be identified and put right, thus diminishing the effects of a real-life emergency of this type.

Organizations and enterprises taking part:

- Fire Brigade
- Civil Defence
- Red Cross
- Dasalud (local Health Service)
- Distrisalud (District Health Authority)
- District Secretariat for Transport
- National Police
- The Antonio Narino Police Training School
- Institute of Social Security
- SENA (national organization for apprenticeship)
- District Disaster Prevention and Preparedness Office
- CRA (Regional Development Corporation)
- DADIMA (district environmental protection office)
- Triple A
- Bayer de Colombia S.A.
- Colterminales S.A.
- Dupont De Colombia S.A.
- Lloreda Grasa S.A.
- Monomeros Colombo Venezolanos S.A.
- Pizano S.A.
- Productos Químicos Panamericanos S.A.
- Promigas S.A.
- Químico Nalco de Colombia S.A.
- Quintal S.A.
- Rohm and Haas Colombia S.A

Timetable

09.05 A chlorine leak is discovered inside the Planta del Acueducto.

09.06 The safety department receives the information, evaluates it and sounds the general alarm throughout the plant.

09.07 The safety brigade appears on the scene.

09.09 The Fire Brigade is informed of the emergency.

09.10 Fire Engine No. 18 is dispatched to the scene along with five Fire Brigade staff.

09.15 The chlorine leak emergency appears to have been brought under control.

09.16 The chlorine gas cloud is shifted and brought under control using water vapor.

09.18 A call is made to the La Loma Fire Station to request the dispatch of Fire Engine No. 6 to support Engine No. 18.

09.22 Engine No. 18 arrives at the scene of the accident.

09.23 The GAT-APELL call-out system goes into operation and the safety organizations and enterprises belonging to the APELL Co-ordinating Group are informed that a chlorine leak emergency has been confirmed and that their presence at the scene of the accident is requested.

09.24 The ambulance from the Soledad Hospital (DASALUD) arrives.

09.25 Personnel from the Police Training School

and Haas, con 4 unidades.
Recibieron la llamada a las 09:25 horas.

09:32 Se hace presente la ambulancia de Bayer, con 6 unidades.
Recibieron la llamada a las 09:26 horas.

09:36 Se hace presente el personal del Tránsito Municipal.

09:39 Se hace presente la Cruz Roja.

09:40 Llega el personal de la Brigada de Productos Químicos Panamericanos.

09:41 Llega la ambulancia de Pizano. Recibieron la llamada a las 9:30 horas.

09:45 Se da la orden de realizar el monitoreo del aire para verificar la concentración en el ambiente. Desaparece la zona roja.

09:48 Se hace presente el personal de la Defensa Civil.

10:00 Llega la ambulancia de Monómeros. Recibieron la llamada a las 09:30 horas.

10:07 Llega el personal de Dupont. Recibieron la llamada a las 09:40 horas.

10:08 Llega el personal de Promigas.
No recibieron la llamada de la Central GAT-APELL.

10:12 Se comunica al Coordinador de la emergencia que la situación ha sido controlada, quien da la orden para el regreso a la normalidad.

10:20 Se cita al personal participante a reunión en la Sala de Conferencias de la TRIPLE A, con el fin de evaluar el ejercicio.

Puntos evaluados

♦ El ejercicio realizado se constituyó en una experiencia positiva para las comunidades vecinas a la Planta del Acueducto de Barranquilla, como son las pertenecientes a los barrios Primero de Mayo y El Ferry, ya que fueron concientizadas y preparadas, para que en el evento de una emergencia real, estén en condiciones de tomar las acciones debidas para salvaguardar sus vidas.

♦ La labor de las personas que fingieron estar afectadas por la emergencia, fue eficiente.

♦ Se logro, la coordinación en el desempeño de las actividades de cada una de las entidades participantes, minimizando así la duplicidad de funciones.

♦ Así mismo, se logro la participación masiva de las Entidades de Apoyo y Brigadas Industriales de las empresas afiliadas al Proceso APELL.

♦ Se observó el entusiasmo y el interés por parte de todos y cada uno de los participantes, lo cual indica de que existe conciencia de Prevención y Concientización en lo que se refiere a materia de seguridad.

♦ El tiempo de respuesta de los grupos de apoyo y brigadas industriales, que participaron en el evento, fue satisfactorio.

♦ Los recursos, tanto humanos como materiales, suministrados por las entidades participantes fueron suficientes para atender la emergencia.

♦ A raíz de la preparación del simulacro, la TRIPLE A implementó sus equipos de seguridad, sin embargo, se detectó la falta de monitores de concentración de cloro.

♦ La red de comunicaciones de la Central GAT-APELL, se activó 19 minutos después de que la TRIPLE A llamara al Cuerpo de Bomberos comunicando la emergencia, razón por al cual algunos grupos de apoyo y brigadas industriales llegaron más tarde de lo esperado. Hubo casos como el de PROMIGAS, que no recibieron la llamada y tomaron la iniciativa de llamar a la Central y dirigirse al lugar de la emergencia.

♦ El Puesto de Mando Unificado, no operó conjuntamente de acuerdo a lo planeado; lo cual no significa que el Coordinador no hubiera llevado a cabo su función.

♦ El Puesto de Clasificación de heridos no se ubico en el sitio acordado, sino en el lugar donde estaba localizado el PMU, por lo cual se obstaculizó su área.

sigue en la pagina siguiente ☛

arrive to cordon off the area.

09.26 Fire Engine No. 6 from the La Loma Fire Station arrives to back up Engine No. 18.

09.27 Some people suffering from the toxic effects of chlorine are transferred to the Soledad Hospital by ambulance.

09.28 The ambulance from DISTRISALUD arrives with four staff.

09.29 Jets of water are played on the chlorine gas cloud, to disperse it and to minimize contamination.

09.30 Having received the emergency call at 09.25, the ambulance from Rohm and Haas arrives, with four staff.

09.32 Having received the emergency call at 09.26, the ambulance from Bayer arrives with six staff.

09.36 Staff from the municipal transport Authority arrive.

09.39 The Red Cross arrives.

09.40 Staff from the safety brigade of Productos Quimicos Panamericanos arrive.

09.41 Having received the emergency call at 09.30, the ambulance from Pizno S.A. arrives.

09.45 The order is given to carry out a check of air quality, to establish the concentration level. This now below the danger level.

09.48 Civil Defence staff arrive.

10.00 Having received the emergency call at 09.30, the ambulance from Monomeros arrives.

10.07 Having received the emergency call at 09.40, staff from Dupont arrive.

10.08 Staff from Promigas arrive. They did not receive the call-out from the GAT-APELL centre.

10.12 The Emergency Co-ordinator is advised that the situation is now under control and gives the general order to stand down.

10.20 Everyone participating in the drill meets in Triple A's conference room to evaluate the exercise.

Points arising from the evaluation

The exercise was a positive experience for the Planta de Acueducto's neighboring communities, particularly Primero de Mayo and El Ferry. Their awareness was raised and they became better prepared to undertake the actions necessary to save lives in the event of a real emergency.

♦ The performance of the people who acted the parts of the victims was effective.

♦ The prior efforts to co-ordinate the activities of each of the participating organizations proved well worth it and minimized duplication of functions.

♦ Similarly, the full participation of the emergency services and the industrial brigades was extremely important.

♦ All participants displayed great enthusiasm and interest, which shows that they had already been made fully aware of the importance of emergency preparedness.

♦ The response time of the participating emergency services and industrial brigades was satisfactory.

♦ The human and material resources allocated by the various participating organizations proved sufficient to handle the emergency.

♦ Because it was involved in preparing the drill, Triple A organized its own safety teams. However the lack of equipment for monitoring concentrations of chlorine was evident.

♦ The GAT-APELL communications centre activated its call-out system 19 minutes after Triple A

continued on following page ☛

☛ *sigue de la página precedente*

♦ Se presentaron inconvenientes con el tráfico vehicular, debido a la falta de conciencia y/o conocimiento de los conductores con respecto a las señales de emergencia, enmarcadas en los Códigos de Tránsito.
♦ La alarma de la TRIPLE A, no se escuchó en los alrededores de la Planta y por lo tanto, algunos vecinos no se dieron por enterados de lo sucedido.
♦ La policía no ejerció el control total sobre algunas vías y permitió el acceso de vehículos.
♦ Se detectaron fallas en la comunicación interna de la Secretaría Distrital de Tránsito y Transporte, hasta el punto de que cuando los observadores asignados llegaron al lugar señalado, el Secretario no estaba enterado del simulacro.
♦ Algunas brigadas estaban listas con sus equipos de emergencia, esperando la llamada.
♦ Algunas de las ambulancias llevaron a las personas que simularon estar afectadas, directamente a los Centros de Atención Hospitalaria, sin pasar primero por la zona de Triage.
♦ El monitoreo no fue divulgado a todas las entidades.
♦ Se observó la presencia de ambulancias dentro de la Planta, con personal sin los elementos de protección adecuados.
♦ Al inicio de la emergencia las ambulancias se dirigieron directamente al interior de las instalaciones de la TRIPLE A, pasando por alto algunas personas afectadas que se encontraban a la entrada del Acueducto.

Una vez realizada la anterior evaluación nos queda la tarea de tomar las medidas correctivas correspondientes, las cuales contemplaremos en nuestro plan de actividades para el año de 1996.

OLGA LUCIA SARRIA DE SLEBI
Coordinadora Proceso APELL

☛ *continued from previous page*

informed the Fire Brigade of the emergency. As a result some emergency responders arrived later than had been hoped. For example staff at Promigas S.A. did not receive the call at all and took the initiative to call the Centre themselves and then proceed to the scene of the accident.
♦ The Unified Command Post (PMU) did not function as previously agreed at the planning stage. However this did not stop the Emergency Co-ordinator from carrying out his functions.
♦ The triage post was set up, not in the place provided but in the same area as the PMU, obstructing its functioning.
♦ There were problems with traffic, due to lack of understanding and knowledge on the part of drivers of the emergency signs as laid down in the Transport Codes.
♦ Triple A's alarm could not be heard in the neighborhood of the plant. Moreover some of the neighbors were not informed of the event.
♦ The police did not exercise complete control over some access roads and permitted some vehicles to enter.
♦ Some internal communications problems occurred within the District Secretariat for Transport; to the point that, when the official observers arrived at the agreed place, the Secretary was not aware that the drill was taking place.
♦ Some brigades were ready with their emergency teams but did not receive the call.
♦ Some ambulances took the people who were pretending to be victims straight to hospital, without going through the triage post.
♦ The results of the air quality monitoring were not revealed to all the organizations.
♦ Ambulance staff were seen inside the plant without adequate protective personal equipment.
♦ At the beginning of the drill the ambulances went directly to the inside of Triple A's installations, taking no notice of "victims" encountered at the entrance.

This evaluation left us with the task of taking the necessary corrective actions, which were addressed in our activity plan for 1996.

zación del Puesto de Mando Unificado (PMU) y los puestos de Triage, así como también se definió, en base a los estudios realizados, la Zona Involucrada en la Emergencia.
♦ Se conformó el PMU y se nombró al Coordinador del mismo.
♦ Se elaboró el Guión-Libreto del Simulacro y se analizo punto por punto, con todos los participantes.
♦ Se determinaron las rutas alternas y cada empresa y entidad participante dio a conocer su tiempo de llegada.
♦ Se designaron los observadores del Simulacro, contando para ello, con la colaboración de los estudiantes de la Universidad Libre y la Corporación Educativa del Litoral.
♦ Se elaboraron, conjuntamente con la Triple A, unos folletos informativos dirigidos a la comunidad de los barrios aledaños a la Planta del Acueducto.
♦ Se solicitó a la Escuela de Policía Antonio Nariño, unas granadas de humo, para simular el escape.

Se llevó a cabo el Simulacro de Emergencia por Escape de Cloro, el 29 de noviembre de 1995, a las 9.00 am, en las Plantas 2 y 3 del Acueducto de Barranquilla. Se evaluó el Simulacro de Emergencia, del cual se anexa una copia al presente informe.

Se elaboraron los cronogramas de actividades de los Comités del Proceso APELL para el año 1996.

Informe de actividades año 1996

♦ Reestructuración de los Comités del Proceso, logrando la participación de todas las empresas afiliadas.
♦ Fusión de los Comités EMERGENCIAS – GAT-APELL, dando como resultado, un Comité muy bien reestructurado, al cual se le dio el nombre de Comité de Emergencias.
♦ Recopilación de los cursos de capacitación que las empresas y entidades de apoyo, están en disposición de dictar. Esto con el fin de intercambiar conocimientos y unificar los criterios en materia de seguridad.
♦ Actualización del inventario de recursos humanos y materiales con que cuenta cada Entidad de Apoyo y cada una de las empresas afiliadas al Proceso APELL.
♦ Preparación del Simulacro, en seco, de Puesto de Mando Unificado, teniendo en cuenta que el funcionamiento de este, fue una de las fallas encontradas en el Simulacro de Emergencia por Escape de Cloro.
♦ Conferencias dictadas, acerca del funcionamiento de un Puesto de Mando Unificado, dirigidas a todas las empresas afiliadas y entidades de apoyo, a participar en el ejercicio a realizarse.
♦ Desarrollo del Simulacro en seco, de Puesto de Mando Unificado el pasado 17 de julio de 1996, en la empresa CARTÓN DE COLOMBIA. Esta actividad fue realizada por el Comité de Simulacros.
♦ Conferencias dictadas por el Proceso APELL, como miembro de la Comisión de Educación del Distrito, con la colaboración de la empresa PROMIGAS S.A., dirigidas a docentes y estudiantes de diversos Planteles Educativos de la ciudad.

Contacto con el Fondo Rotatorio Metropolitano de Valorización, FOMEVA, con el propósito de elaborar el mapa de Riesgos de la ciudad de Barranquilla.
♦ Conferencia Formación de Líderes para el manejo del PMU, dirigida a todos los grupos de apoyo y jefes de brigada de las industrias afiliadas al Proceso APELL.
♦ Elaboración del Boletín de Prensa, relacionado con la Conferencia Formación de Líderes.
♦ Presentación de las actividades del Proceso APELL Barranquilla, en la reunión de APELL ADVISORY GROUP, llevada a cabo a principios del mes de octubre. Esta actividad fue realizada

por el Director Ejecutivo del Consejo Colombiano de Seguridad, como miembro del CORE GROUP DE UNEP

- Presentación General del Proceso, al Alcalde del Distrito.
- Elaboración del Boletín de Prensa y Boletín informativo, acerca de la reunión celebrada con el Alcalde del Distrito.
- Preparación del Simulacro de Comunicaciones, programado para la semana del 18 al 22 de noviembre.
- Desarrollo del Simulacro, en seco, de Comunicaciones, el cual se llevó a cabo en dos etapas, con el fin de evaluar la red de comunicaciones, tanto en horas diurnas como en horas nocturnas. Por otro lado, tratando de acercarnos a la realidad, la hora y fecha exacta de estos eventos no fue divulgada a ninguno de los participantes.
- Elaboración de los Boletines de Prensa relacionados con el Simulacro de Comunicaciones.
- Reunión-Evaluación del Simulacro de Comunicaciones, realizada en la Escuela de Policía Antonio Nariño, con todos los participantes del Proceso APELL, en donde se recogieron todas las observaciones para dar solución a las fallas detectadas en el ejercicio realizado.
- Análisis de las observaciones presentadas, dando como resultado la Evaluación Final del Simulacro de Comunicaciones y sus recomendaciones respectivas.
- Presentación general del Proceso APELL y video del Simulacro de Emergencia por Escape de Cloro, en la reunión del Comité Técnico del Código No.1 de Prácticas Gerenciales del Proceso de Responsabilidad Integral.

Empresas afiliadas en el año de 1996

- CYANAMID BARRANQUILLA S.A.
- CHEMICAL TRANSPORTE LTDA.
- TECNOGLASS S.A.
- TERMOELECTRICA LAS FLORES

Empresas afiliadas potenciales para el año de 1997

- ACERÍAS DE COLOMBIA S.A. – ACESCO
  Gerente : JUAN ALBERTO MONTOYA
  Salud Ocupacional : AMANDA CASALINS
- TERMOBARRANQUILLA S.A. – TEBSA
  Presidente: EDGARDO SOJO
- ASISTENCIA MEDICA INMEDIATA. AMI
  Gerente: JOSÉ ERNESTO MACÍAS
- ELECTRIFICADORA DEL ATLÁNTICO S.A.
  Jefe de Seguridad: MANUEL HERNÁNDEZ
- EMBOTELLADORA ROMAN S.A.
  Salud Ocupacional: MARÍA PATRICIA PABÓN

Plan de acción año 1997

El presente documento corresponde al Plan de Acción del Proceso APELL, propuesto para el año de 1997, el cual contiene los principales puntos a tener en cuenta para el desarrollo de las actividades de los diferentes comités del Proceso.

Motivación

Fortalecimiento de la participación del sector industrial y de los grupos de apoyo del Distrito, en las actividades del Proceso

Divulgación del proceso

Ampliar el conocimiento de la importancia del Proceso, mediante informes periódicos dirigidos a la gerencia de las empresas afiliadas y a la comunidad en general, con el apoyo de medios de comunicación masivos, fortaleciendo la concientización y educación pública.

Sistematización

Conformación de una Base de Datos que sirva de consulta a todos los miembros del Proceso APELL, la cual incluirá básicamente :

- Equipos disponibles en caso de emergencia externa
- Sustancias peligrosas y medidas a tener en cuenta
- Hoja de Vida de las entidades vinculadas al Proceso.

Actualización del manual

Actualización del "Manual de Prevención y Atención de Emergencias Tecnológicas para el Distrito de Barranquilla", elaborado en 1994 por los Comités del Proceso, de tal manera que se constituya en una herramienta importante para todas la brigadas industriales de la empresas afiliadas al Proceso y Grupos de Apoyo participantes.

Fortalecimiento red de comunicaciones

Cubrimiento de una de las debilidades identificadas en los ejercicios de preparación realizados. El plan de actividades comprende una capacitación a los radioperadores de la Central de Comunicaciones GAT-APELL, y brigadas de las entidades participantes y empresas afiliadas al Proceso :

- Manejo de radios
- Manejo de la red de comunicaciones
- Disciplina de la comunicación
- Entrenamiento para el manejo de emergencias
- Adquisición de una línea telefónica para emergencias tecnológicas.

Elaboración del mapa de riesgos de la ciudad

Dotación, a todas las industrias afiliadas al Proceso APELL y Grupos de Apoyo participantes, del Mapa de Riesgos, para que se constituya en una herramienta útil de trabajo para la atención de emergencias tecnológicas.

Se buscará el apoyo financiero de entidades públicas como lo es el DADIMA (Barranquilla) y la CRA (Depto del Atlántico).

Cursos de capacitación

Desarrollo de tres talleres de trabajo, orientados a :

- Intercambio de conocimientos
- Transferencia de tecnología
- Preparación y desarrollo de simulacros internos y externos.

Fortalezas y debilidades

En toda entidad, bien sea gubernamental, comercial, multinacional, o sin ánimo de lucro, como es nuestro caso, se presentan actividades de desarrollo que limitan o inhiben el éxito general o debilidades; y actividades que se llevan a cabo especialmente bien, favoreciendo el giro de la organización o fortalezas.

Para lograr el éxito se debe sacar provecho de las fortalezas y vencer al máximo las debilidades. El primer paso para ello es hacer un análisis interno de la organización con el propósito de identificar tanto los aspectos negativos que afectan el proceso, como los aspectos positivos que lo favorecen.

Refiriéndonos a las debilidades del Proceso Apell, encontramos la rotación del personal de las entidades participantes, al igual que los cambios continuos de las personas designadas para representar a los entes involucrados, teniendo muchas veces que volver atrás para actualizarlos, con el propósito de lograr un seguimiento en las actividades conjuntas.

Otra debilidad, que tiene que ver con el desarrollo del Proceso, es la disponibilidad de tiempo de los dirigentes, y la de alguno de sus delegados, al igual que la participación e interés demostrados por parte de la cabeza del gobierno local y el ente encargado de proteger la seguridad y salud pública.

En cuanto a las fortalezas, podemos decir que existe concientización con respecto a la implementación del plan de respuesta y la necesidad de ponerlo en práctica, como también la preocupación por la seguridad pública. Es así como día a día se logra una mayor participación por parte de las entidades involucradas en una emergencia.

Un aspecto muy positivo es la participación de la industria y su interés por interactuar con las organizaciones de respuesta ante una emergencia, y el convencimiento de la importancia de apoyar el Proceso.

En cuanto a la comunidad se refiere, la industria es consciente de que debe establecer un acercamiento, con el propósito de crear una comunidad bien informada capaz de participar efectivamente y sin miedo en los programas de respuesta ante emergencias.

En cuanto a la participación de la industria es importante resaltar que están conscientes de efectuar un acercamiento con sus comunidades aledañas.

◆

The APELL programme in the Czech Republic

Milos Palecek, Occupational Safety Research Institute, Jeruzalemska 9, 116 52, Prague-1, Czech Republic

Abstract

A pilot project for trial implementation of the APELL programme in the Czech Republic was organized in the county of Kolin, which was chosen because of the presence of chemical and refining plants in the area. Pilot operation of the IZIS information system, designed for the city of Kolin and the surrounding region, began in December 1996. IZIS connects an Emergency Command Centre with state, municipal and regional agencies and organizations, as well as with private companies.

Résumé

Un projet pilote d'application expérimentale du programme APELL en République tchèque a été mis en place dans le comté de Kolin, choisi parce que des usines de produits chimiques et des raffineries y sont implantées. Le système d'information IZIS, mis au point pour la ville de Kolin et ses environs, est entré en service à titre d'essai en décembre 1996. Il relie des services municipaux, régionaux et nationaux, et des entreprises privées à un centre de coordination des secours d'urgence.

Resumen

Se organizó en el distrito de Kolinun un proyecto piloto para la puesta en práctica de las pruebas del programa APELL en la República Checa. Se eligió esta zona debido a la presencia de industrias químicas y refinerías. La operación piloto del sistema de información IZIS, designado para la ciudad de Kolin y los alrededores, comenzó en diciembre de 1996. IZIS conecta un Centro de mando de emergencias con agencias y organizaciones estatales, municipales y regionales y también con las empresas privadas.

Implementation of the UNEP APELL programme in Czechoslovakia and then in the Czech Republic began in 1991. In November of that year the Czech Occupational Safety Research Institute (OSRI) and the Czech Environment Management Centre (CEMC), in cooperation with the International Labour Organisation (ILO) and the US Environmental Protection Agency (EPA), and with support from UNEP, organized a "Safe Production and Use of Chemicals" workshop at which the APELL programme was introduced to participants.

In order to test the principles and approach of APELL in practice, the organizers, together with UNEP, proposed a pilot project for a trial implementation of the APELL programme in the county of Kolin. The Kolin area was chosen because of the presence of chemical and refining plants and the attendant risk of an accident either in the plants or during transport of chemicals by road, rail and inland waterway. There was also already a desire on the part of local and national government to improve safety levels in the region.

Project implementation

Implementation of the pilot project began in 1992. The APELL Handbook (*APELL – Awareness and Preparedness for Emergencies at Local Level – A Process for Responding to Technological Accidents*), translated into Czech, was made available to everyone involved in the project and the approach which it outlines was followed throughout.

Identification of organizations, institutions, communities and people involved

The Kolin County Coordination Board (CB) was established under the supervision of the County Government (CG), with the assistance of OSRI. The board acts as a consultative and coordinating body, assisting the CG Chairman in working out emergency prevention and response plans. Members of the CB are drawn from Kolin county and city authorities, from the management of the companies posing the main threat to safety in the region, and from representatives of the fire brigade, police, medical care and hygiene departments.

The secretary of the Defence Council of Kolin County was appointed to the position of CB Chairman and the statutory position of the CB was established by a regulation, signed by the County Government Chairman, clearly defining its objectives, position, and membership. Participation by a psychologist in the Board's discussions was also found to be very useful.

Evaluation of external hazards

OSRI workers and occupational safety inspectors acted as leaders in acquiring information on hazards in the region. Specialists in the risk of serious accidents took part in the evaluation of the information. This work resulted in the mapping of major chemical hazards posing a threat to the area. As one of the objectives of the project was to harmonize Czech Republic and European Union legislation, participation by safety inspectors had two advantages: it helped to ensure a high level of objectivity in evaluation of the results, and provided an opportunity for the inspectors to increase their expertise in the field.

For hazard identification, a method was worked out based on the approach recommended by ILO and UNEP.

Evaluation of current emergency plans and their deficiencies

The investigation revealed serious deficiencies in emergency planning, not only in Kolin County but in other counties and in the companies investigated. Where layouts and strategies for completed emergency plans existed, they were not functional because plans had not been updated. Moreover, the rapid pace of privatization in the Czech Republic's economy caused many companies to alter their management structures, as well as resulting in the creation of many new ones. The temporary lack of regulations on emergency planning (the Industrial Emergency Prevention and Response Act and associated regulations are still at the proposal stage) means there is no appropriate approach to emergency planning at both company and regional levels.

The results and findings from this evaluation were assessed at a meeting of the CB. The level of importance of current regional issues was also evaluated from the point of view of individual organizations and/or communities or people concerned with emergency prevention, preparedness and response.

A questionnaire survey, aiming to establish priorities at every step of emergency prevention, preparedness and response in the region, was sent to the relevant institutions, authorities and companies. The survey results demonstrated a definite requirement for the creation of an emergency warning and information system containing information on prevention, preparedness and response as well as environmental impacts and protection. It was also decided that the commercial potential of such a data base should be investigated, with a view to covering operating and maintenance costs.

Task identification

The CB meetings and survey results led to a project focusing on the most important prevention and preparedness tasks and on a response system for Kolin county. The project specified individual tasks and indicated the financial resources supposed to come from local and central institutions and organizations.

The splitting of Czechoslovakia into the Czech and Slovak Republics and the subsequent elections in 1994 brought about changes in government personnel, organization and structure, as well as economic changes, which adversely affected implementation of the pilot project and caused delay. Activities in 1994 focused mainly on pre-

paring the legislation necessary for emergency prevention and response to industrial accidents.

In 1995 it was possible to continue with implementation within the framework of a programme created by the Czech Republic's Ministry for the Environment. The Ministry approved the project under the name of "Prevention of Emergency Damage to the Environment".

This project was based on the view that protection of the region's environment from potential emergencies would require the pursuit of activities aiming to reduce the probability of occurrence of accidents; to mitigate potential impacts of an emergency situation; and to improve protection of the population against the effects and impacts of an emergency.

The objectives of the project for 1995 were to:
- propose a model pilot project for environmental protection of the region against potential accidents;
- further develop the HAVARIE information system;
- create a basis and support tools to underpin the final aim of the project – a functioning system ensuring a level of emergency preparedness in the Czech Republic appropriate to the requirements of every region and harmonized with the requirements of European Union legislation, as well as those of the OECD and of the other international organizations of which the Czech Republic is a member.

Efforts were also made to ensure an appropriate level of accident preparedness at regional and local government levels and to raise awareness amongst the general public.

Close ties were established with similar projects and their supporting bodies, including the Czech-Swiss Project for Major Hazard Prevention System for the Czech Republic; the Czech Ministry for Environment's "Technical Background to the Act on Emergency Prevention and Response" project; and the Czech Occupational Safety Office, dealing with the observance of regulations for the storage and handling of hazardous substances.

Installation of the IZIS information system in Kolin

Pilot operation of the IZIS information system, designed for the city of Kolin and the surrounding region, began in December 1996.

Basic functions of the IZIS system

Daily operation and planning:
- environmental monitoring and alarms,
- planning, prevention of emergency situations and collecting of information,
- emergency planning,
- keeping track of storage and transportation of hazardous materials,
- exchange of information between agencies and organizations.

Response
- support for emergency services,
- coordination of response by emergency services and other participants,
- information support for emergency centre,
- response management for individual companies.

Recovery
- planning and control of recovery operations,
- coordination of state agencies, public organizations and private companies.

IZIS connects an Emergency Command Centre with state, municipal and regional agencies and organizations, and with private companies. The system, designed to be highly reliable and flexible, was able to incorporate all of the existing monitoring systems and to accept new ones. The open system architecture will allow for its future extension and connection to other subsystems. ◆

The Manali-Ennore Industrial Area near Madras: implementation of the APELL/LAMP Programme

R.R. Umakanthan, Manager Safety, Health and Environment, and Coordinator Manali-Ennore Industrial Emergency Preparedness Committee, Zeneca ICI Agrochemical Ltd, Ennore Works, Madras 600 057, India

Abstract

The experience gained in implementing the APELL/LAMP Programme in the Manali-Ennore Industrial Area (MEIA) near Madras over four years provides a good basis for further development. Two steps of particular importance in the successful implementation of the APELL process are the signing in 1993 of a four-year Memorandum of Understanding (MOU) between the NSC (National Safety Council) and World Environment Centre (WEC), and the setting up of a National Advisory Committee. Factors contributing to the success of the programme, difficulties encountered, and some achievements to date are outlined.

Résumé

L'expérience acquise après quatre années de mise en oeuvre du programme APELL/LAMP dans la zone industrielle de Manali-Ennore, près de Madras, constitue une base solide pour l'extension du programme. Deux événements ont contribué tout particulièrement au succès du programme APELL : en 1993, la signature d'un Protocole d'accord entre le Conseil national de sécurité (NSC) et le World Environment Centre (WEC), et la création d'un Comité consultatif national. L'article présente les facteurs ayant contribué à la réussite du programme, les difficultés rencontrées et quelques-uns des résultats obtenus à ce jour.

Resumen

La experiencia adquirida en la aplicación del Programa APELL/LAMP en la Zona industrial Manali-Ennore, cerca de Madrás, durante más de cuatro años proporciona una buena base para continuar con el desarrollo. Los dos pasos de particular importancia para la aplicación exitosa del proceso APELL son, por un lado, la firma en 1993 de un Memorando de acuerdo entre el Consejo de seguridad nacional y el Centro para el medio ambiente mundial y, por el otro, la creación de un Comité consultivo nacional. Se presentan los factores que han contribuido al éxito del programa, las dificultades encontradas y algunos logros alcanzados hasta la fecha.

Introduction

This case study describes the implementation of the APELL process in the Manali-Ennore Industrial Area (MEIA) near Madras in the Tamil Nadu State in southern India. This area is the first of six in India in which the APELL process is being implemented. Implementation began in October 1992.

At the national level, the Indian Ministry of Environment and Forests is the nodal ministry for the management of hazardous chemicals. However the APELL process is implemented by the National Safety Council (NSC), an autonomous body forming part of the Indian Ministry of Labour. The NSC has a network of over 4000 members and twelve state Chapters throughout the country. It operates in close cooperation with the Indian government, industries and trade unions.

The APELL process is being implemented in the MEIA by the NSC, in collaboration with the local NSC Chapter and the Manali Industries Association (MIA).

Special features of the Indian situation

In India, the District Collector, or DC (the head of the administration at district level, and desig-

nated as District Emergency Authority (DEA) under the Manufacture, Storage and Import of Hazardous Chemicals (MSI) Rules) is responsible for preparing an Off-site Emergency Plan, with technical input from industry and assistance from the area's Inspector of Factories. However, due to other pressing duties, including maintaining law and order, these officials are often unable to devote enough time to chemical emergency preparedness. The success of the APELL process in an area such as MEIA therefore greatly depends on obtaining the involvement of the District Collector or a nominee.

Under the Factories Act and MSI Rules, the management teams of hazardous chemical plants are responsible for providing certain prescribed information to the population in the vicinity of the plant. Members of the public do not have the statutory right to seek information on their own behalf. Local community awareness and participation in chemical emergency preparedness has therefore been practically non-existent in India.

There is no statutory requirement in India to set up Local Emergency Planning Committees (LEPCs). This is often a requirement in industrially advanced countries, and is a key requirement for starting the APELL process in a local area. The concept of setting up a Coordinating Group with APELL partners as members appeared with the introduction of the APELL process.

Profile of the Manali-Ennore Area

Manali and Ennore are two neighbouring industrial areas located about 20 kilometres north of Madras City. They are under the jurisdiction of the Chengai-MGR district of the Tamil Nadu State. Both areas, particularly Manali, have seen substantial growth in the chemical and petrochemical industries in the last two decades, involving huge investments. Today the Manali-Ennore industrial complex has a concentration of 20 chemical and petrochemical plants, most of which have been identified as Major Accident Hazard units under the statutes. There is a large population in Manali, Ennore and the surrounding districts.

Pre-APELL status

The most important Local Emergency Preparedness actions prior to October 1992 were:

- The first Off-Site Emergency Plan was completed in mid 1989. Work began in 1988. The plan was developed by the District Collector, with technical input from major industries in the area and with the assistance of the Chief Inspector of Factories and other state government departments. It was first rehearsed in June 1989.
- The Manali-Ennore Industries Emergency Preparedness Committee (MEIEPC) was set up in September 1990. This committee of safety professionals was set up by industries in the area to coordinate Off-Site Emergency Planning efforts. It has produced community awareness-raising materials comprising a pictorial booklet of "do's and don'ts", a colour poster on actions to be taken by the community during an emergency, and a condensed version of the off-site emergency plan for initial appreciation of government agencies. The committee has also conducted awareness sessions for officials from the revenue, police, health and other departments of state government.
- The Second Off-Site Emergency Drill was conducted in August 1992, about two months before the first APELL Workshop was held.

Major activities in the MEIA

The most important activities carried out in the MEIA were:

- A pre-APELL visit by a senior industrial consultant from UNEP IE and by the Director General of the NSC took place in April 1992.
- International experience and expertise were provided by UNEP IE and from industrially advanced areas such as Canada, the US, Europe and Australia. Information was gathered from government agencies, universities, LEPCs and industry at different stages, as input on identified priority aspects of emergency preparedness. These aspects included the APELL process, Chemical Emergency Prevention and Preparedness (CEPP), Community Awareness, Computer Aided Management of Emergency Operations (CAMEO), Emergency Medical Response, Hazardous Material Transportation Emergency, HAZMAT, Response by Fire Responders, and Emergency Drills, thus giving comprehensive coverage of emergency planning and preparedness.
- A number of important activities such as Off-Site Emergency Drills, improvements to emer-

APELL: the UK approach

The UK fully supports the UNEP APELL programme. As far back as the early 1970s, the UK was developing its controls in the major hazard field. These incorporated provisions for improving community awareness of hazardous installations and provisions for appropriate emergency response. A programme of regulation was begun, but before it was completed this programme was overtaken by activities on the European scene. The Seveso Directive was introduced and was implemented in the UK as the Control of Industrial Major Accident Hazards Regulations (CIMAH) 1984. These, together with administrative arrangements, contain provisions which meet the objectives of the APELL programme in respect of industrial major accidents.

This article explains how the APELL philosophy is incorporated into UK legislation, procedures and programmes.

The APELL programme

APELL consists of two parts:

- provision of information to the community, referred to as "community awareness";
- formulation of a plan to protect the public, referred to as "emergency response".

APELL's objectives are to prevent loss of life or damage to health and social well-being, to avoid property damage, and to ensure environmental safety in the local community. Its specific objectives are:

- to provide information to concerned members of the community on the hazards involved in industrial operations in their neighbourhood and the measures taken to reduce those risks;
- to review, update or establish emergency response plans in the local area;
- to increase local industry involvement in community awareness and response planning;
- to integrate industry emergency plans with local emergency response plans into one overall plan for the community to handle all types of emergencies;
- to involve members of the local community in the development, testing and implementation of the overall emergency response plan.

UK provisions

In the UK the Home Office, a central government department, has overall policy responsibility for all aspects of emergency planning. However, the Health and Safety Executive (HSE) has policy responsibility for emergency planning in respect of all sites deemed to present a major accident hazard by the CIMAH Regulations. Although APELL encompasses all types of accidents, the main emphasis is on industrial accidents and most of its provisions are implemented in the UK via the CIMAH Regulations.

The CIMAH Regulations apply to sites where prescribed dangerous substances are present above certain threshold levels. There are two thresholds, and those sites which exceed the higher of the two thresholds (known as "top-tier sites") are required to provide information to the public and prepare emergency plans.

Information to the public

The CIMAH Regulations require top-tier sites to provide information to anyone liable to be affected by a major accident on the site with information concerning, amongst other things:

- the activities on-site;
- the dangerous substances;
- the major accident hazards;
- potential effects on the population and the environment;
- how a warning of an accident will be given;
- action people should take in the event of an accident.

The process which is undertaken to determine which members of the public are required to be notified is as follows. HSE undertakes a risk assessment at the site, based on information pro-

gency plans through follow-up actions, and production of videos and other material on community awareness/education, etc. have been developed and conducted through local initiatives and using local resources to demonstrate the development of local competence and commitment, which are key requirements in the APELL process.

Strategic steps

Two steps of particular strategic importance in the successful implementation of the APELL process were the signing in 1993 of a four-year Memorandum of Understanding (MOU) between the NSC and the World Environment Centre (WEC) in New York, and the setting up of a National Advisory Committee.

The MOU was funded by the US Office of Foreign Disaster Assistance (US OFDA), to support APELL-like activities under the Local Accident Mitigation Programme (LAMP). The title "APELL Programme" was therefore expanded to APELL/LAMP, to reflect the collaboration between UNEP IE, WEC and NSC. Although the MOU was not formally signed until November 1993, actual collaboration with the WEC started with the very first APELL Workshop held in the MEIA in October 1992.

The financial support and international technical input guaranteed for four years by the MOU were major contributions to the development of the APELL culture in the area, and to the development of APELL activities into a comprehensive action programme on Chemical Emergency, Prevention, Preparedness and Response. While the APELL Workshop helped prepare the ground, the in-depth follow-up activities over four years contributed to building the superstructure.

To guide the APELL/LAMP process, a National Advisory Committee (NAC) was set up with representatives from four central government ministries, state government, district and municipal administrations, public emergency services, national and local industry associations, NGOs, trade unions and the community. This broad-based committee made a uniquely important contribution to successful implementation of APELL/LAMP activities in the MEIA by providing national-level support to the APELL partners and providing well-thought-out guidelines and recommendations after a review of local level activities.

Factors for success

There were important factors for success, including:

- the international standing of UNEP IE, and the fact that the APELL process is being implemented in a large number of countries. These factors made the introduction of the APELL process acceptable in the local area;
- extension of the APELL/LAMP Programme to five other local areas and to the national level. This provided the opportunity for coordinators from the MEIA to present their experience in workshops and seminars held in other areas, as well as at NAC meetings, providing a stimulus for the work being done in the MEIA.
- involvement of the Asian Disaster Preparedness Centre (ADPC) in local APELL/LAMP activities. The goodwill enjoyed by the ADPC in countries in the Asia and Pacific Region helped focus attention on the relationship between planning for industrial emergencies and natural disasters and enhanced the appeal of APELL/LAMP activities in India.
- the contribution of CAMEO software, together with training in its use, to the application of the APELL process.

Difficulties

Some significant difficulties had to be overcome, principally:

- fostering an APELL process orientation in government officials such as the DCs, as the people occupying such positions are frequently transferred;
- evacuation of the population from vulnerable zones. Given the scale of the operation, only token evacuations were organized during off-site emergency exercises;
- finding shelter in the locality, which is not always easy due to the low-quality housing of "shanty" dwellers living close to the hazardous chemical units in the MEIA;
- inadequate road infrastructure, telecommunications systems and hospital provision, sometimes leading to "bottlenecks" in these areas;
- the low level of literacy in the community, which

vided by the operator. This risk assessment takes into account likely accident scenarios, release rates, prevailing weather conditions, etc. and sets a public information zone around the site. The outer limits of this zone are usually set using dangerous dose criteria for toxic substances or thermal radiation and blast effects for flammables. All those within the information zone must be notified directly by the operator with the information listed above.

Emergency response

Both the site operator and the local authority are required to prepare emergency plans to minimize the effects of a major accident. The site operator's plan is to deal with the on-site effects of the accident, whilst the local authority plan is to deal with off-site effects. The plans are not merged into one, but are required to be complementary, and the HSE would ensure this as part of its assessment of the adequacy of the plans.

The regulations do not detail what the plans should contain, but they do have to be adequate. HSE have issued guidance on the preparation of emergency plans.

The APELL partners

At the national level are government departments (Home Office, Department of the Environment (DoE), Department of Health) plus the HSE. It is at this level that the policies are set for ensuring that adequate provisions are in place to prevent accidents and mitigate the effects of those which do occur.

At the local level are the site operators who run the plants that give rise to the risks, the local authorities who prepare the off-site emergency plans, and the local community and interest groups. Operators and local authorities have statutory duties under CIMAH to determine their involvement, but the community and interest groups do not. They are, however, always included in the preparations for off-site emergencies through their contacts with the local authorities. It is at this level that the policies are put into practice.

Links to other organizations and the development of guidance

It has always been HSE's policy to work with all stakeholders with an interest in emergency planning, in order to develop sensible arrangements to guide people in meeting their health and safety duties. At its most formal level the Health and Safety Commission (HSC) operates a network of advisory committees which bring together experts from stakeholder groups such as employers, employees, local authorities, academia and other government departments to advise HSC on particular topics such as toxic or dangerous substances.

In the field of onshore major hazards, HSC is advised by HSE and its Advisory Committee on Dangerous Substances (ACDS), which has a sub-committee, the Major Hazards Sub-Committee (MHSC). This sub-committee deals specifically with the major hazards sector. Through these committees all the stakeholders have an opportunity to influence legislation and guidance, to ensure that the best knowledge and expertise is available to HSE for its activities.

Conclusion

The UK has arrangements in place to deal with all kinds of emergencies in a way which embraces all the elements of the APELL programme. This involves a variety of regulatory authorities at national level, and key organizations and authorities at local level, which provide the actual response.

Certain improvements to the legislative underpinning of these arrangements will be made in the context of the implementation of the European Union's Seveso II Directive. This will involve greater consultation with the public during the preparation of off-site emergency plans, and requirements for local authorities and industry to test their plans at regular intervals.

For more information, please contact the Hazardous Installations Policy Branch, Health and Safety Executive, room 216, Magdalen House, Stanley Precinct, Bootle, Merseyside, L20 3QZ, UK.

creates difficulties in awareness-raising and education.

Achievements

Implementation of the APELL process in the MEIA has resulted in the following major achievements:

- An APELL orientation is now incorporated into the MEIA's chemical emergency planning and preparedness process. The benefits of the APELL partnership are now understood and accepted by all those involved. In July 1994, a coordinating group with membership from all of the APELL partners took over planning and preparedness activities from the MEIEPC.
- Added emphasis is now being given to Community Awareness activities, especially following the recommendation of international observers in August 1994. A first Community Awareness Workshop was developed, with international inputs from LEPCs in the US. A community awareness video was also produced in the local language.
- Preparation for and organization of emergency drills have been made more professional and effective. The tabletop organization of a full-scale drill proved a particularly useful exercise. The emphasis on this was developed during the APELL-LAMP activities.
- The local emergency plan is now giving proper attention to incidents arising from the transport of hazardous materials.
- Capabilities for applying the APELL process have been developed at both local and national levels. At the national level, a new set of rules on Emergency Planning, Preparedness and Response to Chemical Accidents is ready for enactment under India's Environmental Protection Act (EPA). The new rules will provide statutory backing for involvement of the community and setting up of local coordinating groups, in accordance with the APELL concept.

Conclusion

Emergency planning and preparedness is a continuous process requiring constant updating and ongoing improvement. The experience gained in implementing the APELL-LAMP Programme in the MEIA over four years has provided a sound basis for further development. However, capacities still need to be strengthened.

A feasibility study for the establishment of an Emergency Response Centre (ERC) has been undertaken jointly by the central and state governments and industry. The centre would provide a permanent means of responding to chemical emergencies.

Emergency preparedness in any local area cannot be developed overnight; development requires consistent efforts on the part of all APELL partners. The Coordinating Group set up under the APELL-LAMP Programme, together with the backing soon to be provided by enactment of the EPA and the means provided by the ERC, will provide a structure allowing such efforts to reach a successful conclusion. ◆

The introduction of risk management in Jelgava, Latvia

Andris Maurans, Deputy Director, Production Quality Institute, Atis Zviedris and Guntis Tribis, Riga Technical University, 1 Kalku Street, LV 1638 Riga, Latvia

Abstract

The historic Latvian city of Jelgava faces serious urban planning problems. In 1994, the municipal authority asked scientists from the Production Quality Institute at Riga Technical University to develop a system for zoning hazardous industrial facilities, and to design a risk reduction programme. Activities undertaken in the context of this project, including the use of risk analysis, are described.

Résumé

La ville historique de Jelgava, en Lettonie, est confrontée à de sérieux problèmes d'urbanisme. En 1994, le conseil municipal a demandé à des chercheurs de l'Institut de la qualité des produits (université de technologie de Riga) de mettre au point un système de zonage des installations industrielles dangereuses et de concevoir un programme de réduction des risques. L'article décrit les activités entreprises dans le cadre de ce projet, notamment l'analyse des risques.

Resumen

La ciudad histórica letona de Jelgava se encuentra confrontada con serios problemas urbanos de planificación. En 1994, la autoridad municipal solicitó a los científicos del Instituto de producción de calidad en la Universidad Técnica de Riga que desarrollaran un sistema para detectar instalaciones industriales peligrosas y planear un proyecto de reducción de riesgo. Se describen las actividades emprendidas en el contexto de este proyecto, incluso el empleo del análisis de riesgo.

Introduction

Latvia has been involved with the APELL Programme since the Seminar/Workshop for the Baltic States held on 14-17 June 1994 at Jurmala, near the capital city of Riga. Prior to that time Latvia was already part of the Interagency Risk Management Programme (IAEA/UNEP/UNIDO/WHO), to which the APELL Programme contributes, and through this programme the port of Ventspils received assistance with risk analysis and consequent safety improvements from Dutch experts.

The city of Jelgava has built on both these experiences to begin the process of managing industrial risks.

Background

Jelgava is the third largest city in Latvia, with around 100,000 inhabitants and a university. It is situated on the Leilupe river in the middle part of the country, 40 kilometres from Riga. There is historical evidence that a settlement already existed here in the 13th century. Jelgava has seen prosperous times, in the era of the Duchy of Courland as well as after 1918, when Latvia became an independent state for the first time in its history. It has also been torn by many devastating wars, when foreign armies from the west or the east ravaged the city. The worst devastation occurred at the end of the Second World War, when Jelgava was reduced to little more than rubble and ashes.

Nowadays, Jelgava has a wide range of industries – meat, milk and sugar processing; production of building materials and construction components; and manufacture of agricultural machinery and minibuses. An important railway line runs to the port of Ventspils.

The city inherited many grave urban planning problems from the post-war period of socialist industrialization. In 1994, the municipal authority started work on a long-term city development plan. It asked the scientists of the Production

Quality Institute at Riga Technical University (RTU) to develop a system for zoning hazardous industrial facilities, and also to work out a risk reduction programme. An account of the activities undertaken in the context of this project follows.

Risk analysis of the railway station area

The experts from RTU were able to draw on the work done by the Dutch at Ventspils, as well as on their own extensive knowledge and experience of reliability studies of technical systems. The first stage of their project, carried out in 1994, was to adapt Quantitative Risk Analysis (QRA) methodology for the purpose of calculating risk levels in the railway station area.

The station is situated in the middle of the city and considerable quantities of dangerous goods pass through it. It is estimated that 3000 tonnes of ammonia, 3500 tonnes of methanol, and 100,000 tank cars containing petroleum products are transported through Jelgava every year, as well as quantities of other dangerous goods. Goods trains stop at the station between two and three hours on average before receiving the green light to proceed with their journey. During this time maintenance is carried out. Leakages of hazardous materials are very common. They are detected by smell and eliminated in the most primitive way. This means that the many residents of Jelgava who travel by passenger train to and from their jobs in Riga, and the many students living in Riga who use this train to travel back and forth to Jelgava University, may daily find themselves sitting next to goods trains which pose a serious risk to their safety.

The analysis was conducted in four steps. Scenarios of possible accidents were selected; the probability of each accident actually happening was then calculated; the distances over which the effects would be felt were determined; and numerical values were calculated for individual and societal risk.

The individual risk zone with the probability of lethal outcome caused by the transit of ammonia, P-lethal = 10^{-5}, reaches as far as a radius of 400-500 metres. The chance of someone getting killed in a radius of 400-500 metres from an ammonia truck is 1 in 100,000 each year. This is shown on the map of Jelgava (**Figure 1**). Given the high concentration of people in the station area, the societal risk value is very high: (P-lethal) x (n>10) = 1.2 (?) 10^{-3}. In other words, the probability that at least ten persons will be killed is 1.2 times in 1000 years. This is one hundred times greater than international norms for admissible societal risk.

Extension of the risk analysis

In 1995, the analysis was extended to cover systematic identification and evaluation of the other hazardous industrial facilities in Jelgava. These facilities were identified as the meat and milk processing factories, the city oil storage facility, and five petrol stations. It was estimated that the most serious risk to the city's residents arose from the ammonia used as a cooling agent in the refrigeration systems of the milk processing factory. This factory is located in a densely populated part of the city. There are more than ten blocks of flats in the high-risk zone, in a radius of 60-80 metres, with the value of the individual risk P-lethal = 10^{-5}.

In **Figure 2** risk contours for this factory are shown for a month, for a year, and for a specified incident.

Figure 1
Risk zones of dangerous sites

Results and lessons learnt

RTU used several different methods of risk analysis in its work:

- *Fault Tree Analysis*: The "top event" is the starting point. The initial "base" event is identified among the prior events. The probability of the top event can then be worked out, on the basis of an analysis of the combination of lower-level events that are necessary and sufficient in order for it to occur.
- *Event Tree Analysis*: This begins with a given event and goes on to look at its consequences and the conditions that must prevail in order for it to go further. These initial events could be malfunctions in components, human errors, or external events such as landslides or lightning striking.
- *Cause and Effect Analysis*: This type of analysis is a combination of the two types above. It may begin with an intermediate event.

This approach makes RTU's work useful both to municipal authorities interested in potential consequences, and to industrial enterprises interested in analysing their processes and identifying weak points for improvement.

The Risk Matrix approach was felt to be extremely useful in the process of developing municipal risk management. This approach permits the simple classification of sources of risk without requiring an elaborate quantitative risk analysis for each of them, this latter being confined only to those installations in the "catastrophic consequences" class.

Meterological conditions were identified as a major factor in the possible spread of the undesirable consequences of an accident. Parameters such as wind direction, wind speed, air temperature, and relative humidity may vary according to the season. Therefore, over 20 years' worth of data were used to calculate average values for each month. These values were then used to help construct risk zones for each month and for a

Figure 2
Dangerous site: ammonia refrigeration system in the milk processing factory at Jelgava

whole year. Sometimes separate calculations were made for day and night, especially when estimating societal risk.

The monthly risk maps provide a good basis on which industrial firms can plan hazardous operations. For example, refilling of refrigeration systems with ammonia can be organized to take place at times when fewer people are in the area. The yearly risk map can be used in development planning, and also in planning for rescue services both within enterprises and at the municipal level.

Based on Latvian figures for registered accidents and deaths, RTU concluded that activities involving the use of hazardous materials were safer than in other parts of the former Soviet Union but several times more dangerous than in western European countries. The probability of the destruction of a pressure vessel in Latvia is calculated at $P=10^{-4}$, i.e. on average one pressure vessel in 10,000 will be destroyed every year. Similar figures have been determined for railways and pipelines.

It was also concluded that, in the undesirable event of an accident happening, at least the opportunity should be taken to check relevant predictions resulting from the risk analysis and make any necessary adjustments to emergency plans. Latvia's national Civil Defence Centre does not have the financial and other resources needed to supply every district in the country with computers and software in order to create a CAMEO network. However, almost every enterprise using hazardous materials has PCs on which software such as ALOHA and ARCHIE could be installed, and on which such further analyses could be carried out as necessary.

Further steps in the APELL process

A working group has been set up to develop a risk reduction programme in accordance with the APELL process. This is chaired by the Deputy Director of RTU's Production Quality Institute. The first task was to identify the institutions and individuals in industry and government that needed to be involved. It was soon found that four completely unconnected authorities had responsibilities for chemical accident response:

- the municipality's Fire and Rescue Unit;
- Latvian Railways' Jelgava Fire and Rescue Brigade;
- Jelgava Station's Emergency Response and Short Term Recovery Brigade (under the command of the station master);
- the security officer on duty at the Pieostas plant within the port of Ventspils.

Each of these authorities has its own terms of reference and area of operations. The brigades of the municipality and of Latvian Railways are well equipped and trained to deal with fires, but not with chemical accidents. The main task of the brigade under the command of the station master is to mark off a safety zone boundary by means of special warning signs. It does not have the equipment to contain a chemical accident, and the personal protective equipment at its disposal is of low quality. The security officer at the Pieostas plant does have a modern chemical protection suit at his disposal. As he is on duty alone, however, he would be unable to contain a serious chemical accident without help. In any case, his terms of reference are confined to response actions related to freight loads of hazardous materials, mostly ammonia, which arrive at the Pieostas plant.

The situation concerning law enforcement is similar. The national police, the national army, the home guard, the municipal police, and the railway police all perform separate official duties within the city. Each has its own management hierarchy. In the event of an emergency, either decisions can be taken without reference to the other bodies or the decision can be made to take no action at all, on the grounds that the emergency is outside the jurisdiction of the persons making the decision.

The working group has had a hard task persuading various officials of the importance of cooperative planning for emergencies, despite limited financial and physical resources. Nevertheless, it envisages the development of a coordinated civil protection plan based on a common understanding of the assessed risks. This plan will include training, development of a notification system, and evacuation schemes where necessary. Considerable attention is being paid to the existing competencies of the various organizations involved and to the vital importance of full cooperation to ensure effective response to emergencies.

The Jelgava risk reduction programme thus comprises activities both to minimize the risk of accidents (prevention) and to ensure efficient localization of the consequences and protection of the population should an accident occur (response). It is thus encouraging preparedness, which is the objective of the APELL process and programme.

Conclusion

Jelgava has made a start on the process of risk management by using quantitative techniques to analyse the technological risks within the city. This analysis will now form the basis of concrete action to develop integrated emergency plans. ◆

World Environment Center: progress in implementing APELL in selected countries

Overview

In many developing countries, in the aftermath of Bhopal and other major industrial accidents, chemical disaster management has assumed a high priority on national agendas. This is manifested by the near universal acceptance of APELL Seminar/Workshops in over 70 countries as a starting point for empowering communities to manage their chemical risk.

Since October 1992, USAID's Office of Foreign Disaster Assistance (OFDA) has provided funding to the World Environment Center (WEC) to establish prototype prevention and mitigation programmes to address environmental and man-made disasters and emergencies in high-risk urban centres in India, Indonesia, Mexico and Thailand. The APELL concept has been implemented by WEC through Local Accident Mitigation and Prevention (LAMP) programmes that establish community-based emergency preparedness and prevention at selected high-risk sites. In India, the programme is managed by WEC in cooperation with the National Safety Council of India (NSCI). In Mexico, Thailand and Indonesia the programmes are managed through the local WEC office in each country. By working closely with government, industry and community leaders at the local and national levels, APELL/LAMP helps at-risk communities to improve assessment and communication of chemical risks, develop emergency preparedness plans, and improve emergency response to hazardous spills and releases, including hazardous materials transport accidents.

Good progress towards long-term, effective collaboration between industry, government and local communities in initiating appropriate disaster prevention and mitigation activities has been achieved at several high-risk sites in the four target countries. In most cases, there is good support from a national nodal agency for replication of APELL/LAMP programmes at multiple sites throughout each target country.

The sites where the most progress has been made to date are:

Mexico: Vera Cruz State (Coatzacoalcos, Vera Cruz, Orizaba and Poza Rica);

India: Madras, Bombay, Cochin, Haldia, Kanpur and Baroda;

Thailand: Map Ta Phut and Bangpoo Industrial Estates;

Indonesia: West Java State (Cilegon and Tanzeran) and Gresik/Surabaya.

Some typical APELL/LAMP activities and the benefits/outcomes are given below.

APELL/LAMP activities

Target communities are selected by the respective APELL/LAMP Programme Manager in each country, based upon the programme's criteria. By definition, APELL/LAMP sites are where the risks of man-made disasters exist as real threats to human life and property. Primary consideration is given to sites where flammable and poisonous chemicals are produced, with secondary consideration given to sites at risk from the storage and transport of those chemicals. In addition, evidence of some previous community, government and industry participation is taken into account in the selection of initial target communities. In some cases, new relationships are established through APELL/LAMP processes.

Once sites have been determined, APELL/LAMP focuses on the local level and works with industry groups, civil servants, regulatory agencies and community leaders committed to minimizing the risks of technological disaster. With the support and involvement of these local leaders, APELL/LAMP conducts activities that markedly improve the level of safety, awareness, and preparedness in case of accidents.

Activities are always adapted to suit the particular needs of the targeted sites and communities. As a rule, APELL/LAMP activities reflect the ten-step method promoted by the APELL programme. Thus, most programmes begin with an APELL workshop to introduce concerned parties to the issues associated with emergency preparedness and disaster prevention. Additional, supporting activities under LAMP are then conducted, such as:

- risk assessments of plants and industrial complexes;
- chemical emergency preparedness and accident prevention (CEPAP) training, in cooperation with experts from the US Environmental Protection Agency's Office of Chemical Emergency Preparedness and Prevention (US EPA/CEPPO);
- community awareness and education seminars;
- information management seminars, including the use of US EPA's Computer Aided Management of Emergency Operations (CAMEO™) technology as well as other database systems for emergency planning and response;
- first responder training in industrial fire safety and the control of hazardous materials incidents, including hazardous materials transport accidents;
- training for doctors, nurses and paramedics in medical response to chemical accidents;
- table-top exercises and mock emergency drills involving local response teams;
- assistance in setting up local level planning committees;
- help in setting up a national level emergency planning and response networking system; and
- other appropriate activities suiting the needs of at-risk communities.

APELL/LAMP activities to date have focused on Mexico, India, Indonesia and Thailand. However, some APELL/LAMP activities have been carried out in Chile, Costa Rica, the Czech Republic, Hungary, Jamaica, the Slovak Republic and Venezuela. Since 1992, the APELL/LAMP Programme has been involved in over 20 target communities.

APELL/LAMP programme benefits and impacts

The major benefits and impacts of the LAMP programme at the *local level* in each country are:

- increased industry sensitivity to risk reduction and accident prevention, and increased adoption of emergency preparedness and response plans;
- increased coordinated disaster preparedness and prevention in high-risk communities;
- an increased number of trained technological accident responders;
- increased community involvement in disaster prevention and response for defined accident scenarios;
- periodic and regular testing of local emergency preparedness and response plans; and
- strengthened local, regional and national technological disaster response networks.

National level **impacts are:**

- new legislation supporting the formation of local emergency coordination committees with representatives of the community and industry, as well as government;
- national level disaster planning and coordination committees with representation from industry associations, insurance groups, government ministries, and national service organizations; and
- new funding resources made available for the purchase of emergency response equipment, and replication of programmes to more sites.

International level **impacts are:**

- adoption by other countries of a community-based emergency preparedness approach to empower local communities to take charge of their own safety in regard to toxic and hazardous chemicals; and
- recognition of accomplishments from international agencies.

For more information about WEC activities implementing APELL, contact The World Environment Center, 419 Park Avenue South, Suite 1800, New York, NY 10016, USA. Tel: +212 683 4700, Fax: +212 683 5053

Gestion des risques industriels majeurs : expérience du Groupe Chimique Tunisien, région de Gabès

Groupe Chimique Tunisien, Direction Générale des usines de Gabès, Tunisie

Abstract
After the creation of a safety division in its plants, the Tunisian chemical group Groupe Chimique Tunisien organized a regional seminar to raise awareness of major technological risks. This article describes the contents of the seminar and the actions taken in the field to improve safety in plants and to organize response in the event of accident.

Résumé
Après avoir mis en place une division de sécurité dans ses usines, le Groupe Chimique Tunisien a organisé un séminaire régional de sensibilisation aux risques majeurs. L'article décrit le contenu du séminaire et les actions entreprises sur le terrain pour améliorer la sécurité dans les usines et organiser les secours en cas d'accident.

Resumen
Tras haber establecido una división de seguridad en sus fábricas, el Grupo químico de Túnez organizó un seminario regional de sensibilización ante riesgos mayores. El artículo describe el contenido del seminario y las acciones emprendidas en el terreno para mejorar la seguridad en las fábricas y organizar el auxilio en caso de accidente.

Introduction

Le Groupe Chimique Tunisien, région de Gabès, comprend trois usines. La première a ouvert ses portes en 1972. L'effectif des trois usines est actuellement de 1823 personnes.

- Usine d'acide phosphorique
- Usine de D.A.P.
- Usine d'ammonitrate

Les principales matières premières utilisées dans les différentes usines sont : le soufre, le phosphate et l'ammoniac. Les produits fabriqués sont : l'acide sulfurique, l'acide nitrique, le dicalcium phosphate, le diammonium phosphate et les ammonitrates.

Organisation de la sécurité au sein du groupe

Une division de sécurité, rattachée directement à la direction générale des usines, a été créée en 1985 avec pour mission :

- la restructuration des services de sécurité existant dans les différentes usines,
- la coordination entre ces services,
- la soumission de propositions sur la sécurité à la direction générale.

Au cours de la même année, un plan de travail a été élaboré avec l'appui des directeurs des usines et de la direction générale. Sa mise en œuvre a permis :

- une prise de conscience collective de la part de tout le personnel, hiérarchie comprise,
- l'éveil de l'esprit de sécurité chez tout le personnel,
- une aide mutuelle entre les services de sécurité des différentes usines du groupe,
- une baisse appréciable du nombre des accidents du travail.

Depuis 1985, chaque année des programmes d'amélioration de la sécurité sont élaborés et mis en œuvre. Les actions de formation en matière de sécurité générale et spécifique se poursuivent sans relâche depuis cette date pour l'ensemble du personnel des usines.

Depuis 1996 une réorganisation est en cours pour renforcer la fonction sécurité. Outre la mission classique qui est dévolue à la nouvelle structure, la démarche prévoit la création de deux nouveaux services au sein de la division sécurité:

- un service documentation, études et formation (EDF) ;
- un service prévention et amélioration des condistions de travail (PACT).

Sensibilisation aux risques majeurs

Les accidents graves survenus pendant cette période de tant dans les pays industrialisés que dans les pays en voie de développement, et plus particulièrement les accidents impliquant de l'ammoniac, ont amenés le Groupe Chimique Tunisien, en 1988, à envisager l'organisation d'un séminaire local sur les risques majeurs.

L'idée d'un séminaire a commencé à se concrétiser en 1989, grâce à l'aide de l'Association Tunisienne de Sécurité et d'Amélioration des Conditions de Travail (ATSACT) et celle du centre Industrie et Environnement du Programme des Nations Unies pour l'environnement (PNUE IE) qui, du 30 octobre au 3 novembre 1989, a effectué une mission de diagnostic préliminaire de sécurité pour la préparation du séminaire. Ce diagnostic a mis en évidence la nécessité de promouvoir une véritable politique de sécurité spécifique à la prévention des risques industriels majeurs au sein du Groupe Chimique Tunisien.

Les risques recensés lors de cette mission concernaient essentiellement les tuyauteries de dépotage et les réservoirs de stockage d'ammoniac liquide, les stockages de soufre solide et liquide, les stockages d'ammonitrate agricoles et poreux et les stockages des engrais N.P.K.

Pour pallier aux insuffisances recensées, des actions ont été engagées, notamment :

- des travaux de remise en état de la tuyauterie de dépotages de l'ammoniac ;
- le fractionnement des cuvettes de rétention des bacs de stockage d'ammoniac afin de réduire les surfaces d'évaporation ;
- le by-passage et l'abandon des cigares d'ammoniac à l'usine DAP ;
- l'identification et le repérage de tous les réservoirs de stockage dans les différentes usines (repère – contenu – capacité).

Le second volet du programme d'action s'est concrétisé en 1990 par un séminaire organisé avec la collaboration de l'ATSACT et du PNUE IE, du 5 au 9 novembre 1989, dans les locaux du centre socio-culturel du Groupe Chimique.

Trente-six participants étaient présents, dont vingt-et-un haut responsables du Groupe Chimique, parmi lesquels deux directeurs d'usine et le directeur général. Le séminaire portait sur les études d'évaluation des risques, l'élaboration des plans d'urgence, les moyens de prévention et les dispositifs à mettre en œuvre pour faire face à une situation de crise.

Le séminaire comportait notamment :

1- **Des exposés théoriques** par le PNUE sur le programme APELL (sensibilisation et prévention des accidents industriels), les études d'évaluation des risques et les plans d'urgence, les problèmes spécifiques à la sécurité dans les usines de fabrication d'ammoniac et d'engrais.

2- **Des travaux de groupe (ateliers)** comprenant des études sommaires d'évaluation des risques à partir de dix scénarios d'accident pour un même type de danger et l'élaboration d'un plan d'organisation interne dans ses grandes lignes.

3- **La présentation des travaux de groupe** avec discussions et la formulation de recommandations.

Ces recommandations ont par la suite donné lieu à un atelier national APELL, qui s'est tenu du 8 au 11 novembre 1991.

Elaboration des plans d'opération internes (P.O.I.)

Quelques semaines après le séminaire régional, un groupe de travail a été constitué au sein de chaque

usine pour établir un plan d'opération interne (P.O.I.). Les cours théoriques de séminaires antérieurs et des articles sur le sujet parus dans certaines revues spécialisées ont servis d'outils de référence. L'expérience pratique faisant défaut, certaines questions sont restées sans réponse.

Pour chaque P.O.I., l'étude d'évaluation des risques a consisté en une série d'estimations préliminaires des risques pour des scénarios d'accidents les plus probables pouvant avoir des conséquences de grande ampleur. Pour chaque scénario, l'importance du risque et l'ampleur des conséquences étaient évaluées et estimées sommairement faute d'outils informatisés appropriés à ce genre d'étude. Dans les trois scénarios retenus, l'accident considéré était une perte de confinement importante.

- **Scénario A** : rupture de la plus grosse tuyauterie de soutirage d'ammoniac entrainant le plus fort débit massique.
- **Scénario B** : rupture d'une citerne de 25 tonnes d'ammoniac après son remplissage.
- **Scénario C** : rupture de la conduite de dépotage d'ammoniac entrainant le plus fort débit massique.

Les caractéristiques des nuages toxiques d'ammoniac pouvant se former au moment de l'accident ont été déterminées en fonction des paramètres de temps ou de durée de la fuite et des conditions météorologiques.

Les effets de toxicité de l'ammoniac sur l'environnement ont été déterminés à partir des données disponibles sur la toxicité du produit.

C'est le guide d'élaboration du Ministère de l'Environnement de la France qui a servi de base pour l'élaboration de chaque plan d'organisation interne.

Pour chaque P.O.I., les chapitres suivants ont été approfondis et détaillés :

1. a) **Alerte** : information nécessaire pour déclencher les opérations de secours. Deux niveaux d'alerte ont été pris en compte.

b) **Fiches réflexes** : description de ce que doit faire tout témoin d'un incident.

2. **Situation géographique** : indications destinées aux intervenants externes afin de réduire le délai d'intervention.
3. **Evaluation des risques**
4. **Recensement des moyens** : moyens internes et externes pour lutter contre l'incident.
5. **Organisation des secours:** comment réunir en toutes circonstances :
   - du personnel capable de prendre des décisions ;
   - des moyens humains et matériels d'intervention.
6. **Exercices d'entrainement** : exercices destinés à vérifier la fiabilité du P.O.I. et à combler les lacunes éventuelles.

Actuellement un P.O.I. a été élaboré et diffusé dans chaque usine : un cycle de formation et de vulgarisation de ces P.O.I. destiné à tout le personnel des usines a été réalisé ; des fiches réflexes détaillant la conduite à avoir en cas d'accident ont été distribuées.

Des exercices pour tester les P.O.I. ainsi que la simulation d'un accident de grande ampleur sont prévus.

Actions réalisées ou en cours

A ce jour, plusieurs actions sont achevées, d'autres sont en cours de réalisation ou budgétisées dans les programmes d'investissement.

- Une formation destinée à tout le personnel, hiérarchie comprise, a été réalisée. Des séances de rappel, de recyclage et de perfectionnement sont programmées en continu.
- L'achat d'appareils respiratoires isolants, de lances à rideaux d'eau, de matériel de production de la mousse et émulseur, et de matériel logistique de remplissage des bouteilles a déjà été fait.
- Un système de sonorisation et d'alerte indépendant des standards téléphoniques des usines et en dédoublement de ces derniers est en cours d'installation dans les trois usines.
- Un appel d'offres est lancé pour l'achat d'un logiciel permettant d'affiner les études des risques.
- la construction de locaux de confinement et des travaux d'étanchéité des locaux existants sont en cours.
- Des exercices à blancs faisant intervenir les brigades de la protection civile des gouvernorats avoisinants ont été réalisés.
- Une formation destinée aux intervenants de la protection civile sur l'ammoniac et les produits chimiques en général a lieu chaque année depuis 1994 à raison de 4 sessions par an.
- Depuis 1992, de nombreux secouristes sont formés et suivent des sessions de recyclage tous les deux ans.
- Des pompes de transvasement en cas d'épandage important on été achetées et leur installation est en cours.
- Un organisme agréé a effectué un contrôle minutieux des réservoirs de stockage travaillant à pression atmosphérique et n'a pas relevé d'anomalies particulières (3 réservoirs sur 4 contrôlés à ce jour).
- Quatre cigares d'ammoniac sous pression de 4 bars ont été mis hors d'usage pour ne conserver qu'un stockage cryogénique plus sécuritaire.
- Le prolongement de la conduite de dépotage d'ammoniac vers un quai dégagé et l'achat d'un bras de déchargement pour ammoniac sont en cours.
- l'aménagement de la conduite de dépotage, longue de 2000 mètres, par son raccourcissement et son tronçonnage par ajout de vannes d'isolement commandées à distance est budgétisé.
- Des séances de formation et de sensibilisation des principaux responsables des usines et institutions sises dans la zone industrielle ont été réalisées. ◆

Activities of the OECD Chemical Accidents Programme related to APELL

The Organisation for Economic Co-operation and Development (OECD) has had a programme on chemical accident prevention, preparedness and response since 1988, when Ministers and other high level representatives called for such a programme at the OECD Conference on Accidents Involving Hazardous Substances. To supervise this work a group, now called the "Expert Group on Chemical Accidents", was established. The Expert Group includes representatives of OECD countries, the European Commission, and relevant international organizations, with participation by representatives of industry, labour and other groups as appropriate.

The OECD Chemical Accidents Programme has three primary objectives:

- sharing information and experience;
- analysing specific issues of mutual concern; and
- developing guidance useful to all the relevant stakeholders, including public authorities at all levels, industry, workers and their representatives, and the public and community-based organizations.

OECD work on chemical accidents is undertaken in close cooperation with several United Nations bodies, including UNEP IE, the International Programme on Chemical Safety (IPCS), the International Labour Office (ILO), the United Nations Economic Commission for Europe (UN/ECE), the World Health Organization (WHO), the International Maritime Organization (IMO), and the joint UNEP/Department of Humanitarian Affairs Environment Unit (UNEP/DHA Joint Unit).

The Expert Group has endeavoured to ensure that the products of its work address the needs of both OECD and non-OECD countries and that these products are as widely distributed as possible. The other international organizations cooperating in this work have undertaken to facilitate worldwide distribution. In some cases, other international organizations (for example, UNEP IE and IMO) have also provided translations of OECD publications that originally appeared in English.

Guidance documents and other publications

The OECD has proven to be an effective forum for achieving concrete results of practical use to those responsible for various activities related to chemical accidents. The major product of the Chemical Accidents Programme has been the ***Guiding Principles for Chemical Accident Prevention, Preparedness and Response***, published by the OECD in 1992. The *Guiding Principles* set out general guidance for the safe planning, construction, management, operation and review of the safety performance of hazardous installations. They address the roles and responsibilities of public authorities, industry, employees and their representatives, as well as other interested parties. The *Guiding Principles* are available from the OECD in English, French and Russian and will soon be available in Spanish. To help ensure that they remain up-to-date and reflect best practice, the *Guiding Principles* will be reviewed, and revised as appropriate, in 1998-1999.

The *Guiding Principles* are based on the results of major workshops organized to address various aspects of chemical accident prevention, preparedness and response. These workshops, and a number of other OECD workshops held since the *Guiding Principles* were published, have involved the active participation of hundreds of individuals from government, international organizations, industry, trade unions, academia, and public interest groups and other non-governmental bodies. Such workshops provide the opportunity to exchange information and experiences and reach conclusions concerning best practice. The output of the workshops is published in the form of free-on-demand OECD publications which can be requested from the OECD or accessed at no charge via the OECD's World Wide Web site (see below).

The *Guiding Principles* have been widely distributed worldwide, in cooperation with a number of other international organizations. UNEP IE has worked especially closely with the OECD in both the development and distribution of the *Guiding Principles*. Supplementary Text prepared by UNEP IE is directed towards the recipients of technology or technical and financial assistance, as a counterpart to the sections of the *Guiding Principles* on "Transfer of Technology and International Investments" and "Bilateral and Multilateral Technical and Financial Assistance". The *Guiding Principles* and the Supplementary Text have been combined in a special binder distributed to the APELL Advisory Group and to APELL and UNEP focal points.

A number of guidance documents have been prepared, or are being considered, to supplement the *Guiding Principles*. One of these is the Joint OECD/International Maritime Organization ***Guidance Concerning Chemical Safety in Port Areas*** (1996), which takes into account the outcome of a workshop co-sponsored by the IMO, the OECD and UNEP IE, as well as related IMO publications. French and Spanish translations of the English text, provided by IMO, were recently published by the OECD. Copies of this guidance document are available from IMO or the OECD in any of the three languages.

Another guidance document published by the OECD, ***Guidance Concerning Health Aspects of Chemical Accidents*** (1996), is based on the results of a joint IPCS/OECD/UNEP IE/WHO-ECEH (European Centre for Environment and Health) workshop. (The outcome of that workshop was originally published by the OECD in 1994 as *Health Aspects of Chemical Accidents*.)

This guidance document is available from the OECD in English and French.

The OECD and UNEP IE cooperated in the production of the ***International Directory of Emergency Response Centres***, published by the OECD in 1991. As indicated in the introduction to the directory, it has always been intended that this publication would be regularly updated and expanded. The directory is currently being updated as a cooperative activity of OECD, UNEP IE and the UNEP/DHA Joint Unit.

The project on risk assessment related to chemical accident prevention, preparedness and response

An extensive OECD project was initiated in 1995 to facilitate communication concerning risk assessments, in the light of the conclusions of the July 1995 ***Workshop on Risk Assessment and Risk Communication in the Field of Chemical Accident Prevention, Preparedness and Response.***

The objective of the project is simple: to facilitate understanding of, and communication concerning, assessment of the risk associated with potential accidental releases at facilities which produce, use, handle, store or dispose of hazardous chemicals. However, achieving this objective is somewhat more complex, given the range of risk assessment approaches in use in the public and private sectors in various countries and the problems associated with communication among different cultures and languages.

To achieve its objective, the project is directed to the ***development of a computer-based "dictionary/thesaurus"*** which will make the intended meaning of terminology and documentation associated with the risk assessment process (as used in different countries and organizations) more transparent. A range of information concerning different risk assessment methods will be collected in a way that allows better understanding of the nature of the risk assessment process and its outcomes, as well as facilitating the choice of the most appropriate methods in specific circumstances (including consideration of, for example, legal and cultural contexts, resource availability, technical contexts, etc.).

These products, which will be made available to the general public through the Internet, are intended to be valuable to a wide range of interested parties. The project will *not* seek to harmonize terminology, nor will it attempt to judge the relative value of different methods.

It has been agreed that additional activities with respect to improving risk communication would be valuable and should be undertaken at a later stage.

The project on accident reporting and statistics

The purpose of this project is to ***facilitate the sharing of information concerning past accidents among countries*** in order to learn from experience.

Collection and sharing of accident reports has been a part of the OECD Chemical Accidents Programme virtually since its inception. France has taken the lead in implementing this project through the Bureau d'Analyse des Risques et Pollutions Industrielles (BARPI) in Lyon. BARPI is also undertaking a parallel project on behalf of UN/ECE.

The OECD Expert Group is in the process of reviewing the objectives of, and processes related to, this project in order to improve consistency in reporting and to clarify the information that will be available to OECD countries. It is hoped that, once the project is operating smoothly, it will be expanded to collect (and disseminate) accident reports worldwide.

Other activities

The OECD Chemical Accidents Programme was extended recently for the three-year period 1997-1999. A number of new activities have therefore been initiated, including the following:

A ***Workshop on Human Performance in Chemical Process Safety*** was held in Munich in June 1997 at the invitation of the German government. The report of this workshop will be published in early 1998.

A ***project on economic aspects of chemical accidents*** has begun with the comparison of national case studies using a common approach. The OECD Expert Group will determine what follow-up activities are appropriate at its December 1997 meeting.

A ***project on accident investigations*** is seeking to facilitate sharing of experience related to accident investigations (i.e. experience specifically related to the means used to determine the root causes of accidents) and to learn lessons from accidents which have occurred.

At its December 1997 meeting, the Expert Group will consider ***means for improving communications with small and medium-sized enterprises (SMEs).*** One part of this project is the development of a publication specifically targeted to SMEs, utilizing the OECD *Guiding Principles* and the results of the SME Workshop which is in preparation.

Other subjects which might be addressed in the 1998-1999 work programme include further guidance related to preparedness and response, risk communication, and environmental and non-lethal health consequences of accidents.

For more information about OECD activities related to chemical accident prevention, preparedness and response, contact the OECD Environment Directorate, Environmental Health and Safety Division, 2 rue André-Pascal, 75775 Paris Cedex 16. Fax: (33) (1) 45.24.16.75. E-mail: ehscont @oecd.org; web site: http://www.oecd/ehs/

Waste minimization: water use in a Kenyan milk powder factory

Michael W. Okoth, Lecturer, Department of Food Technology and Nutrition, University of Nairobi, P.O. Box 29053, Nairobi, Kenya

Abstract

Water consumption was measured in a milk processing plant which primarily produces milk powder and butter. There is no milk powder production in the dry season, when the milk is pasteurized and taken elsewhere for packaging. Distribution of water to different parts of the factory was analysed. The factory's water saving potential is estimated to be 45 per cent during the dry season and 43 per cent during the milk powder production season. Proposals are made for saving water.

Résumé

Des mesures de la consommation d'eau ont été effectuées dans une usine de transformation du lait produisant principalement du lait en poudre et du beurre. Pendant la saison sèche, la production du lait en poudre est interrompue et le lait est pasteurisé puis expédié ailleurs pour être conditionné. La distribution de l'eau dans les différentes parties de l'usine a été analysée. Les économies possibles sont estimées à 45 % pendant la saison sèche, et 43 % pendant la saison de production du lait en poudre. L'article propose des mesures pour économiser l'eau.

Resumen

Se midió el consumo de agua en una fábrica elaboradora de leche que produce principalmente leche en polvo y mantequilla. No hay producción de leche en polvo durante la estación seca, cuando se pasteuriza la leche y se la envía a otro lugar para el empaquetado. Se analiza la distribución de agua en diferentes lugares de la fábrica. Se estima el potencial de economía de agua de la fábrica en un 45 por ciento durante la estación seca y en 43 % durante la estación de producción de leche en polvo. Se efectúan propuestas para economizar el agua.

Introduction

Availability of water is crucial in a milk processing plant. Cleaning and disinfection activities are the major consumers, but water is also required for generation of steam. In Kenya most dairy plants are located in urban areas and obtain their water from the municipal water supply system. Unfortunately, most municipalities have difficulties meeting the water demand. A reduction in water consumption by processing plants would therefore help alleviate the water supply problem. Where a rural processing plant draws water directly from a small river or stream, excessive water use may lead to inadequate water supplies being available for downstream users.

The use of water far in excess of the optimum quantity necessitates the provision of unduly large water supply and treatment systems, which require a large capital outlay. In addition, the cost of water supply and treatment is high. Where water is obtained from a utility firm or a municipal council, the water bill adversely affects the profitability of the processing plant.

Since a considerable part of the water used in a milk processing plant is heated, increased water consumption is usually associated with increased thermal energy consumption, which not only increases operating costs but also adversely affects the environment. Most of the water used in a milk processing plant ends up in the waste stream. The use of too much water therefore results in too much effluent, thus increasing the cost of effluent treatment and disposal.

Water consumption in a milk processing plant was measured daily. The plant, which has a processing capacity of 150 tonnes of milk per day, primarily produced milk powder and butter. There was no milk powder production in the dry season, however, when the milk was pasteurized and taken elsewhere for packaging. **Figure 1** shows the processing operations.

Measurement methods

The turbine meter (type "Woltmann WSK", WFA Wassermesserfabrik AG, Zurich) used to measure total water consumption was 125 mm in size and had a range of 2.5 to 260 m^3/h, with an accuracy of +/- 2 per cent of measured flow rate.

The cold water supply to various hose pipes used for cleaning was measured using turbine meters (type "Aqua metro PMKF", Aqua Metro AG, Basle). They were 25 mm in size and had a range of 70 to 10,000 l/h and an accuracy of +/- 2 per cent of measured flow rate.

Turbine meters (type "Aqua metro PMKF", Aqua Metro AG, Basle) were used to measure the quantity of cold water supplied to the can washing machines. These meters were 20 mm in size and had a range of 30 to 5000 l/h and an accuracy of +/- 2 per cent of measured flow rate. A pulse generator (type "Aqua metro RH", Aqua Metro AG, Basle) attached to the meters produced voltage pulses, each pulse denoting the passage of one litre of water through the meter. A microcomputer obtained the pulse counts via a Modular-Input-Output-System (MIOS 488, Leukhardt Systems, Tuttlingen, Germany) and displayed the measured flow rate on a monitor, in addition to producing printed output.

In some cases, the measurement of temperatures followed by mass and energy balance yielded fresh water flow rate. Where possible, the water flowing during a known time period was collected and weighed to obtain the flow rate.

Results and discussion

Data were collected in two consecutive years. In year 1 data collection was carried out from May to December, while in year 2 it was done from January to December.

Table 1 shows mean daily production and water consumption data for the two years. As indicated in this table, and demonstrated graphically in **Figure 2**, specific water consumption (water consumption per kg milk intake) increased considerably in the second year when compared with the corresponding months of the first year. Considering the months of May to August, specific water consumption varied from 5.0 to 6.0 kg per kg milk intake in year 1, whereas in year 2 the range of variation was 7.0 to 7.2 kg per kg milk intake. Increases in year 2, as compared with year 1, varied from 20 per cent in August to 42 per cent in June, despite the fact that milk powder production between May and August was higher in year 1.

The explanation lies in the operation of the cooling towers for warm water from the condenser in the evaporation section of the plant. The two cooling towers have to operate in parallel, as neither can handle all the water from the condenser. Although one of the cooling towers became inoperative towards the end of year 1, it continued to receive its share of warm water from the condenser. Since the water was not cooled, because there were no air fans, it was not recirculated to the condenser; it simply overflowed to the drain. Instead, cold fresh water was supplied from hose pipes at the bottom of the water sump,

without a float valve to regulate its flow, and pumped to the condenser together with the cold water from the operating cooling tower. The water wasted in this way contributed immensely to the increase in water consumption in year 2. It should be noted that the cooling towers operated as described above throughout year 2.

The rest of the results in this paper were obtained in year 2.

As shown in **Figure 3**, the daily specific water consumption during the period when there was no milk powder production varied from about 2.8 to about 5.8 kg per kg milk intake; 54 per cent of the total number of days considered had specific water consumption figures of 3.5-4.5 kg per kg milk intake. The average for all the days considered was 4.4 kg per kg milk intake. Average water consumption figures in liquid milk plants in the United Kingdom (Elsy, 1980) and in the European Union as a whole (BandK-Birch and Krogboe, 1987) of 2.77 and 2.85 kg per kg milk intake, respectively, were about 36 per cent lower than in the Kenyan milk processing plant. It should be noted that BandK-Birch and Krogboe (1987) and Elsy (1980) also reported water consumption figures of up to 4.54 and 5.65 kg per kg milk intake, respectively. Three of the Australian liquid milk plants studied by Tuck (1983) had specific water consumption averaging 1.9 kg per kg milk intake, which is 57 per cent lower than in the Kenyan plant.

Figure 4 shows the frequency distribution of daily specific water consumption when the milk powder section operated at least part of the day. Specific water consumption varied from about 5.2 to about 8.0 kg per kg milk intake; 62 per cent of the days considered had specific water consumption figures in the range of 6.6-7.4 kg per kg milk intake. The average for all the days considered in Figure 4 was 7.0 kg water per kg milk intake. BandK-Birch and Krogboe (1987) reported that milk concentrate and powder plants in the EU consumed an average of 3.7 kg water per kg milk processed. However, they found a correlation between daily milk intake (size of the plant) and specific water consumption: larger plants had lower specific water consumption. Plants in the category into which the Kenyan plant falls had a mean water consumption of 3.1 kg per kg milk intake. This is 56 per cent lower than that of the Kenyan plant. Smaller plants in the EU, however, had an average water consumption of 7.2 kg per kg milk intake.

In **Figure 5** the relationship between daily specific water consumption and milk intake when there was no milk powder production is shown. In spite of the rather wide scattering of the data points, it is evident that specific water consumption tends to decrease with an increase in milk intake. A linear regression yields the following equation (with an average error of 11.5 per cent):

Specific water usage = 6.21 - 0.019* (milk intake in tonnes) (kg/kg milk intake)

(Eqn 1)

Figure 6 seeks to show the relationship between water consumption and milk powder production

Figure 1
Processing operations in the Kenya milk plant

Table 1
Mean daily production and water consumption

Month	Year	Milk intake (t)	Milk powder (kg)	Butter (kg)	Water (t)	kg water per kg milk
May	1	124.4	9341	5957	706	5.7
June	1	146.8	11212	5407	732	5.0
July	1	130.6	9502	5299	717	5.5
August	1	119.4	9100	4374	722	6.0
September	1	119.1	6497	4809	681	5.7
October	1	111.6	1819	3242	539	4.8
November	1	119.1	3430	3850	582	4.9
December	1	132.4	8257	5619	786	5.9
January	2	119.1	3694	4203	635	5.3
February	2	99.5	1510	2307	592	5.9
March	2	85.0	0	910	366	4.3
April	2	88.1	1096	1183	455	5.2
May	2	120.0	8252	4869	834	7.0
June	2	121.0	10623	5001	857	7.1
July	2	119.9	9502	5312	872	7.3
August	2	116.3	8608	5250	833	7.2
September	2	108.1	7068	4576	803	7.4
October	2	121.3	6648	4639	661	5.4
November	2	124.1	8981	5205	948	7.6
December	2	114.7	8927	4825	882	7.7

Figure 2
A comparison of specific water consumption in years 1 and 2

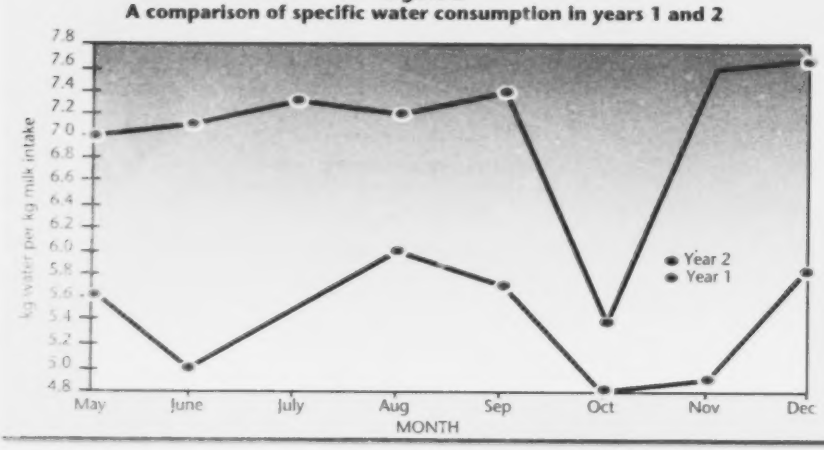


Figure 3
Daily variation in specific water consumption when there was no drying of milk

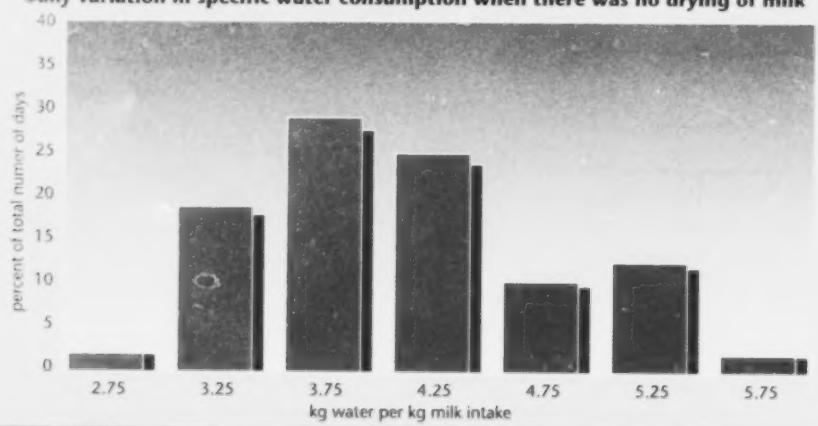
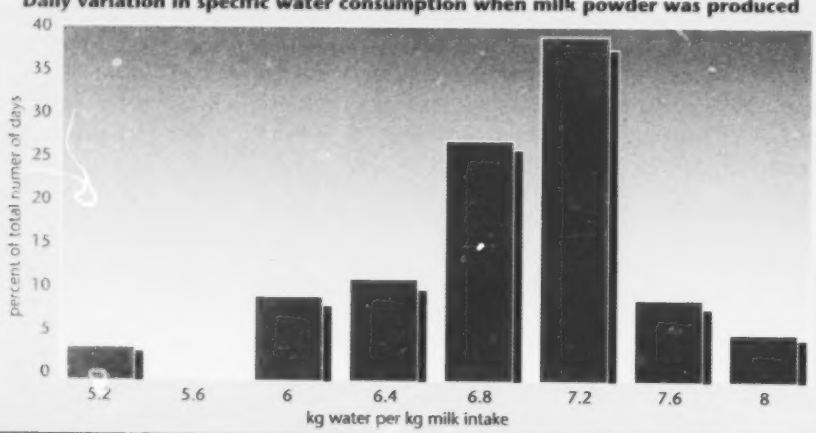


Figure 4
Daily variation in specific water consumption when milk powder was produced



in kilograms per tonne of milk intake. The relationship is not quite obvious. A close look at the dense population of data points, however, reveals a general trend of gradual increase in specific water consumption with increase in daily milk powder production per tonne milk intake. Indeed, this trend is confirmed by the linear regression of the data points which results in the following equation (with an average error of 6.7 per cent):

Specific water usage = 6.29 + 0.0082 (kg powder/t milk) (kg/tonne milk intake)
(Eqn 2)

The distribution of water during the period of milk drying is shown in **Figure 7**. Total water consumption was 826 m^3 per day, on average. The three largest water consumers were the evaporation section, the milk pasteurization section, and the milk reception section, contributing 50, 14 and 10 per cent, respectively, to total water consumption. It should be pointed out that in fact the drying section accounted for only 0.2 per cent of total water consumption. Condensing, cooling and the vacuum pump accounted for 89 per cent of the total water used in the evaporation and drying section. The water cooling towers alone accounted for 30 per cent of the factory's total fresh water requirements. Cleaning of equipment, cans, floors, etc. accounted for 32 per cent of the total.

Figure 8 shows the distribution of water when there was no milk powder production. An average of 366 m^3 of water was consumed per day. The major users were the milk pasteurization section, milk reception section, and butter section with shares of 37, 19 and 16 per cent, respectively. Cleaning of equipment, cans, floors, etc. accounted for 62 per cent, while 16 per cent of total water supply could not be accounted for. Some of this water was used in toilets, bathrooms and the laboratory.

Considering year 2 as a whole, water was distributed in the factory as shown in **Figure 9**. Total water consumption was 266,631 m^3. The leading consumers were the evaporation and drying section (43.4 per cent), milk pasteurization section (17.6 per cent), and milk reception section (11.5 per cent).

Conclusions and recommendations

Water consumption in year 2 averaged 4.4 kg per kg milk intake, with the lowest figure being around 2.8 kg per kg milk intake when there was no milk powder production. The lowest figure is equal to the average water consumption in EU liquid milk plants (BandK-Birch and Krogboe, 1987) but is higher than the average for three Australian liquid milk plants of 1.9 kg per kg milk intake (Tuck, 1983). A target water consumption figure of 2.4 kg per kg milk intake appears reasonable. The potential water saving at the Kenyan plant when there is no milk powder production is therefore 45 per cent of the level of consumption in year 2.

At 5.5 kg per kg milk intake, water consumption in year 1 was considerably lower than the 7.0 kg per kg milk intake found in year 2 during the period of milk powder production. A mean figure of 3.1 kg water per kg milk intake has been reported for EU milk concentrate and powder plants in the same size category (BandK-Birch and Krogboe, 1987). It is reasonable to conclude that a target water consumption level of 4 kg per kg milk intake can be attained in the Kenyan plant without any major investment. The potential water saving during the period of milk powder production is therefore 43 per cent of the level of consumption in year 2.

The following water saving measures are recommended:

1. renovation or replacement of water cooling towers;
2. standardization of cleaning procedures;

Figure 5
Relationship between daily specific water consumption and milk intake when there was no drying of milk

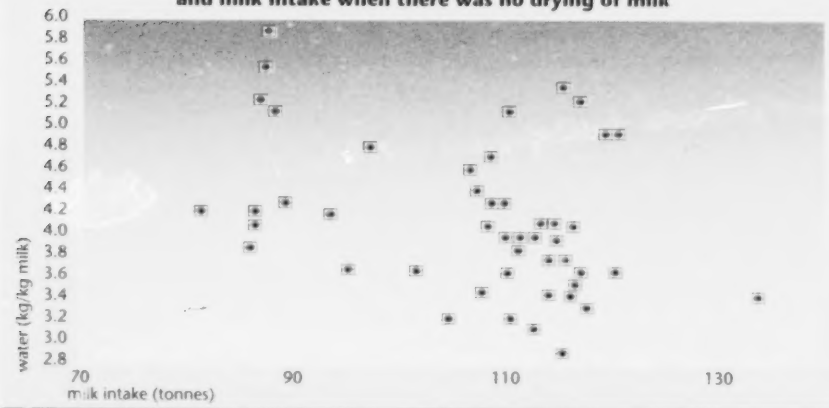


Figure 6
Relationship between daily specific water consumption and powder production in kg per tonne milk intake

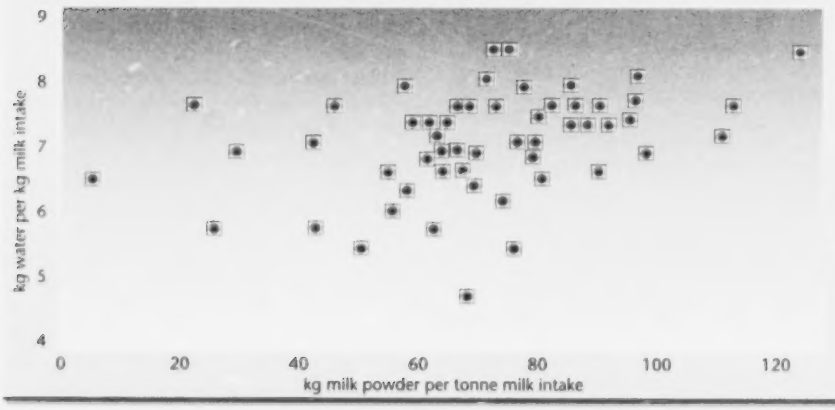


Figure 7
Distribution of water, period of milk drying

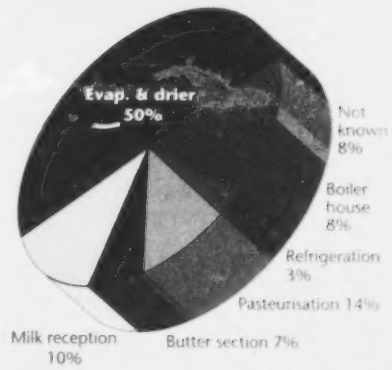


Figure 8
Distribution of water, period of milk pasteurisation

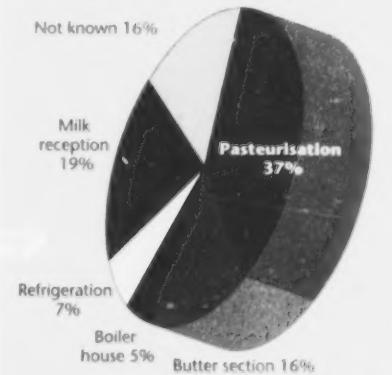
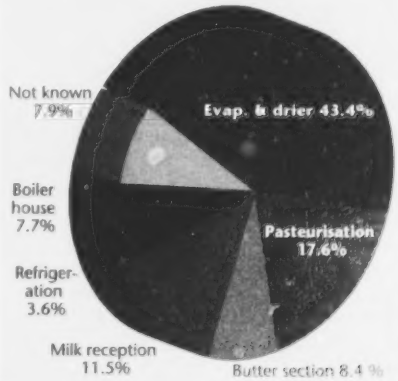


Figure 9
Distribution of water in year 2



3. fitting of automatic shut-off valves on hose pipes;
4. elimination of all leakages;
5. installation of a CIP system with recycling capability for the milk silo tanks;
6. minimization of overflow of make-up water in the plate heat exchangers for milk and cream;
7. reduction of steam consumption and hence the amount of water required for generation of steam;
8. return of all the steam condensate to the boiler;
9. utilization of all the vapour condensate from the evaporator;
10. reuse of the water from the vacuum pumps.

Acknowledgements
Financial support from the Swiss Development Co-operation (DEH) is gratefully acknowledged. I also acknowledge receipt of useful advice from Prof. Dr F. Emch, Dr P. Muench, and Mr U. Glunk, formerly of the Food Engineering Laboratory, Swiss Federal Institute of Technology, Zurich (ETH), and Dr W. Schulthess, formerly of the Department of Food Technology and Nutrition, University of Nairobi, Kenya.

References

Birch and Krogboe (1987) Energy Audit No. 7: Dairy industry in the European Economic Community, Report EUR 10868 EN, Commission of the European Communities, Brussels.

Elsy, B. (1980) Survey of energy and water usage in liquid milk processing. Milk Ind. 82(10), 18-23.

Tuck, J. (1983) Energy management in milk processing. Energy Authority of New South Wales, Sydney. ◆

How can we substantially increase eco-efficiency?

Jacqueline Cramer, Professor of Environmental Science, University of Amsterdam, and senior consultant, Philips Consumer Electronics.
P.O. Box 80082, 5600 JB Eindhoven, The Netherlands

Abstract
This article addresses the question of how we can substantially increase the eco-efficiency of processes, products and services. It is argued that significant leaps forward in environmental improvements require the integration of the environment with other policy areas, while keeping the long-term sustainability objectives in mind. This approach, called "a strategy for sustainability" is elaborated on the basis of two practical Dutch examples (from the municipality of Tilburg and the Sound & Vision/Consumer Electronics division of Philips). In order to assess the merits of the approach in general, it is recommended that more experiments are carried out.

Résumé
L'article traite des moyens qui permettraient d'augmenter sensiblement l'efficacité écologique des procédés, produits et services. Selon l'auteur, pour parvenir à des améliorations environnementales notables, il faut intégrer l'environnement dans d'autres domaines d'action, sans pour autant perdre de vue les objectifs de durabilité à long terme. Cette approche, appelée "stratégie pour la durabilité", s'appuie sur deux exemples pratiques concernant, l'un la municipalité de Tilburg, l'autre la division Sound & Vision/Consumer Electronics de Philips. Mais pour évaluer les mérites de cette approche, d'autres expériences s'imposent.

Resumen
Este documento trata de la manera en que se puede aumentar significativamente la ecoeficiencia de los procesos, productos y servicios. Se afirma que para lograr avances significativos en el tema medioambiental es necesaria la integración del medio ambiente con otras zonas políticas, mientas que se tengan presentes en la mente los objetivos de sostenibilidad a largo plazo. Este enfoque, llamado "una estrategia para la sostenibilidad" se elabora en base a dos ejemplos prácticos holandeses (de la municipalidad de Tilburg y de la División de Sonido y Visión de electrodomésticos de Philips). A efectos de evaluar los méritos del enfoque en general, se recomienda que se

Introduction

Achieving sustainable development presents an enormous challenge to society. It means that within just a few decades we must learn to deal much more efficiently with energy and raw materials. According to some estimates, within the next 50 years the burden on the environment will have to be reduced to an average of one-tenth of the current levels (this means an increase in eco-efficiency by a factor 10) in the highly industrialized, Western countries (Weterings and Opschoor, 1992; Schmidt-Bleek et al., 1994). Such estimates are somewhat lower when all countries in the world are included. For instance, Von Weizsäcker, Lovins and Lovins (1995) talk about an increase in eco-efficiency at world level by a factor 4.

An improvement of eco-efficiency on this scale has to be achieved one way or another. Either processes, products and services will have to become far less material and energy intensive, or patterns of consumption will have to change substantially (for instance through substitution of meat by protein foods and limitation of car use in cities and a reduction in air travel). Ultimately, the two approaches converge: companies are driven by the market, and fundamentally different products or services can only be produced if there is sufficient demand for them. In the long term, therefore, the consumer will have to change just as much as the producers. It will become impossible not to address the issue from both directions. The government faces the task of encouraging greater eco-efficiency among both producers and consumers and creating the enabling conditions for less environmentally harmful production and consumption.

Will we be able to secure the necessary substantial improvements in eco-efficiency in time? I am convinced that, in principle, we can. But it will mean consistently working in the right direction. One of the problems here is the planning horizon of government and companies: in practice they do not look 50 years ahead, or even 20, but generally three to four years at most. It is certainly possible to improve eco-efficiency within such a short space of time, but fundamental improvements will often require a long-term vision. While improvements can be made in the short term, the long-term objective must be kept in sight. How can we resolve this conflict between the short term and long term?

In this article, I present two practical Dutch examples: from the public sector the municipality of Tilburg and from industry Philips Consumer Electronics. Both organizations have attempted to integrate a long-term environmental policy in their day-to-day management. In discussing them, the emphasis is not on the tangible concrete results (it is too early for them), but on the approach.

These two examples do not stand alone. Similar efforts are being made elsewhere in the Netherlands and also in the rest of the world, both at municipal and company level. To give some examples: a large number of major companies have joined the World Business Council for Sustainable Development, which also aims at substantial eco-efficiency gains. Some leading companies have started to integrate this ambitious goal into their business strategy.

Moreover, in response to the Agenda 21 action programme formulated at the UNCED conference in Rio de Janeiro (1992), many cities have formulated a local Agenda 21. This local programme describes the process in which all those concerned in a local community can contribute to sustainable development, both in the short and the long term.

Finally, in the campaign for Sustainable Development in Europe, the environmental organisation Friends of the Earth lines out how sustainability in Europe can be achieved (Friends of the Earth, 1995) using similar long-term environmental goals as mentioned above.

Thus, within various bodies the ambition has been formulated to increase the eco-efficiency level substantially by means of a long-term approach. In this article we will discuss how such a long-term process can be set up.

From incremental to more far-reaching environmental improvements

Taking stock of the current state of the art in environmental policy, it is interesting to note that among both companies and institutions and (local) government bodies the primary concern is with "incremental improvements" of existing working methods, products and services. They are looking, first and foremost, for possibilities to increase eco-efficiency without having to make extensive changes to existing products, processes

and social structures. Besides curative measures, through the application of end-of-pipe techniques (such as filters or grease traps) they are primarily concentrating on improving the company's internal process management with the aim, as far as possible, of preventing waste and emissions.

Companies have realized noteworthy environmental improvements through this incremental approach. For example, Dutch companies have carried out many pilot projects to reduce the environmental burden of their products through preventive measures. The pilot projects within the framework of PROMISE (Product Development with the Environment as Innovation Strategy) illustrate these attempts (Te Riele and Zweers, 1994). The PROMISE programme clearly shows that the incremental improvements are not only good for the environment, but are often profitable for the company, too. Win-win situations occur for instance in cases where fewer raw materials and less energy are used, the costs of waste processing and environmental levies decrease and/or the recycling potential becomes profitable. The time scale for these changes usually relates to pay-back periods of no more than three years.

The environmental profit to be gained from such optimisation should not be underestimated. Jansen and Vergragt (1993) estimate that *on average* industry's eco-efficiency can be increased through incremental improvements by a factor of 1.3 to 1.5 (a reduction of the environmental burden to some 75% of current levels). When we accept this estimate as a reference, more far-reaching environmental improvements are needed if we desire to reach higher eco-efficiency levels.

Moreover, incremental improvements provide significant progress in the early stages by capitalizing on "low-hanging fruit" (the easy improvements). After that first period, incremental changes become less profitable in terms of both economic and ecological efficiency (Arthur D. Little, 1996). Then more far-reaching environmental improvements begin to deliver a higher reduction in environmental impact at relatively lower costs.

These more far-reaching environmental improvements require more fundamental choices related to a time scale of three to 15 years and even beyond that. Within the more far-reaching environmental improvements, a distinction must be made between strategic and radical improvements.

Strategic environmental improvements focus on a redesign of existing products or processes within the strategic planning horizon of the particular company or government body. Examples of such changes are the phase-out of CFC in response to the ozone depletion issue, or the design for recycling of TV sets.

Radical environmental improvements exceed the strategic planning horizon of the company or government body and focus on a rethinking of the product in an even more fundamental way. Such improvements can lead to a radical change in the existing product (e.g. the use of sustainable energy sources in consumer electronics products) or lead to fulfilling the function of the product in another way. Examples of the latter improvements are the substitution of meat by novel protein foods produced through biotechnological techniques, or the replacement of physical transportation by emerging information technologies.

In contrast to the "incremental" environmental improvements discussed above, it is seldom easy to make a leap forward with more far-reaching environmental improvements. Incremental improvements can usually be introduced relatively easily, in part because they are often restricted to parts of a production process or product. For instance, if we wish to reduce atmospheric emissions from a car we fit it with a catalytic convertor.

In the case of more far-reaching environmental improvements, the situation is different. For instance, when we look for a transport system that could replace our current system (based on the car), we find ourselves confronted with many other issues. Urban development, for instance. Or the trade-offs between fiscal policy and transport policy. At that point, it becomes impossible to avoid taking the environment as just one factor among many that have to be weighed up in an integrated societal framework.

So how can we prevent environmental considerations from being overwhelmed when such a wide range of considerations have to be taken into account? After all, experience has taught us that whenever societal choices have had to be made, up to now economic considerations have almost automatically prevailed over the environment. We have to develop an approach where on the one hand, the environment is integrated with other policy areas, and on the other hand, the long-term sustainability objectives (for instance over a period of three to 15 years and even beyond that) are kept in mind. The path to achieving these objectives must be constantly adjusted to take account of changes in markets, technological options, etc. I call such an approach a strategy for sustainability. Drawing up and implementing such strategies for sustainability requires a different way of resolving (environmental) problems than those we are used to. It means not looking at environmental problems in isolation, but as part of a wider strategic policy.

If we are to make sustainability an automatic factor in the process of balancing the different societal considerations, a framework for sustainability has to be drawn up on a case-by-case basis. A framework for sustainability is a programme of requirements, guidelines and criteria which ought to be followed over a substantial period of time. In such a policy framework, the opportunities and risks for the environment and socio-economic, political and cultural factors are weighed against each other in such a way as to produce a result that could be called sustainable. Sustainability involves finding a balance in the long term between the factors referred to above. The challenge here is that far from using the prevailing socio-economic situation as the yardstick, we must in fact have the nerve to question it for the benefit of the living environment (Advisory Board of Transport, Public Works and Water Management, 1995).

Strategies for sustainability can be drawn up by individual companies or by chains of companies seeking to achieve far-reaching environmental improvements in their production techniques. They can also be drawn up by government bodies. In the area of transport, for instance, the goal would be to identify more sustainable solutions for the mobility problems in a country, or to produce more sustainable urban development plans for cities. Depending on the topic to be addressed, the time scale may differ (from three to five, up to 15 years and even beyond that).

With the aid of two practical Dutch examples, I will explain below how the public sector and business can achieve leaps forward in environmental improvement with the aid of strategies for sustainability. I will also show how such initiatives follow on from existing environmental activities. As an example from the public sector I have taken the municipality of Tilburg, which has formulated strategies for sustainability as part of its Second Municipal Environmental Policy Plan. My second example is drawn from the insights gained in formulating strategies for sustainability within the Sound & Vision/Consumer Electronics division of Philips. I was closely involved as a consultant in both cases.

The example of the municipality of Tilburg

Tilburg has acquired considerable experience with implementing municipal environmental policy in recent years. On the basis of that expertise, in 1994 it observed that the policy implemented up to then had its limitations. There was too much emphasis on "tackling symptoms" and too little on "measures at the source" (GMP2, 1995). The intention with the new environmental plan – the Second Municipal Environmental Plan (1995) – was to adopt a different approach. By giving greater emphasis to an environmental policy focusing on sources and prevention, and by integrating environmental policy with other policy areas (urban planning, economic policy, industrial policy), Tilburg hopes to secure far-reaching environmental improvements.

This trend towards "integration" of environmental policy with other policy fields can also be seen in other Dutch municipalities and government agencies. The environment is no longer seen merely as a limiting factor against which the permissibility of a proposed activity has to be tested (against the standards of the Noise Abatement Act in the case of building plans, for example). Environmental policy is increasingly a "supportive policy", which has to be taken into account even at the planning phase. Efforts are even being made to incorporate environmental objectives in numerous other policy areas (so-called "facet policy", e.g. planning of specific parts of policy). This provides a far better foundation for the search for creative new solutions to environmental problems.

So how did Tilburg bridge the gap from an approach where environment was a pre-limiting factor to a supportive, or even facet, policy? The lead was taken by Tilburg's Department of the Environment. First, the department drew up a list

of the urban activities that touched on the environment. To integrate those societal activities and environmental aspects, they then formulated a strategy for sustainability for each activity. This resulted in strategies for sustainability in the following eight areas of urban activity:

1. urban development;
2. business activity;
3. environmental awareness in households;
4. building;
5. traffic;
6. waste management;
7. energy management;
8. water conservation.

Each strategy for sustainability incorporated a vision of sustainable development: this set out the environmental themes raised in each policy area, the social groups the policy was targeted at and the role the municipality should play. To ensure that far-reaching environmental improvements have a realistic chance of being included in day-to-day political considerations, for each strategy for sustainability a "sustainability framework", setting out measurable objectives that the municipality wanted to achieve, was drawn up. This forces everyone involved to think creatively about the possibilities of adjusting the policy towards sustainability. Finally, a list was drawn up of all the actions that could be implemented in the context of a strategy for sustainability.

Example 1 and **Example 2** (see below) illustrate this. These examples represent an initial effort to achieve integration of environmental aspects in the major public activities in the municipality of Tilburg.

This type of approach means that Tilburg's Department of the Environment has to seek much closer cooperation than previously with other municipal services and other bodies and organizations involved in implementing policy. In fact, the question arises whether in the long term such cooperation might not lead to complete horizontal integration of environmental issues in all services. The environment would then no longer have to be seen as a separate sector. It has not reached this point yet. However, in the Tilburg approach we can already see that a number of environmental measures no longer fall strictly under the responsibility of the municipal Department of the Environment: for instance, the Office of Public Works is taking the lead in the implementation of the "urban traffic" strategy for sustainability. So the success of that strategy has come to depend on the willingness and the ability of the Office of Public Works (and the alderman with political responsibility in that area) to actually take environmental factors into account.

Also in the area of urban business activity, for instance, the Department of the Environment has to cooperate more closely. In the strategy for sustainability for "urban business activity" the priority is to stimulate internal corporate environmental protection (including waste prevention) and encourage eco-technology and innovation. This calls for a different type of cooperation with companies than previously, when the principal concern of the Department of the Environment was the issuing of licenses and monitoring of compliance with their terms. Implementation of the strategy for sustainability calls for closer communication/consultation with businesses. The Department of General Affairs (Economic Affairs department) has plenty of experience in this, so cooperation with this department has become very important.

Whether the approach adopted by Tilburg will actually lead to far-reaching environmental improvements depends on a number of factors. For instance, the efforts of the various municipal services and the politically accountable aldermen will be decisive. They must be willing and able to genuinely integrate sustainable development into their policy. They will sometimes be faced with enormous contradictions. On the one hand, in order to preserve political and public support it is necessary to pass measures that are supported by the citizens. On the other hand, it is sometimes necessary from a sustainability perspective to take unpopular measures. What might be very popular with the public (driving into the town in a car, for instance) may pose major problems for the town as a whole (smell and noise nuisance). The political masters must try to steer a course through this social dilemma of the individual interest versus the public good.

Furthermore, some changes at local level can only be initiated with support from central or provincial government. Traffic and transport problems in Tilburg, for instance, can only be resolved partially at the local level. They require a more general policy of discouraging the use of cars by the central government, for example by changing fiscal and/or urban development policy.

Besides the local politicians and the municipal services, the success of strategies for sustainability is also determined by other social groups involved in establishing environmental policy in Tilburg. If, for example, the locally organized business community, the local transport companies or the local consumers' and environmental organizations were to cooperate in the search for more sustainable solutions it would have a positive impact. Strategies for sustainability implemented jointly could lead to better solutions from an environmental perspective than if the municipal Department of the Environment tried to do it alone.

The success of the Tilburg approach aimed at strategies for sustainability is therefore not assured in advance. But the GMP2, and the strategies for sustainability formulated in it, do at least provide

Example 1:
The "urban development" strategy for sustainability

Objectives:

1. Testing of all new development plans against the criteria of sustainability.
2. Wherever possible, managing all public green space in the town in an ecologically sound fashion.
3. Strengthening the function and visibility of green space in the town.
4. Implementation of programmes in the areas of noise abatement and soil.

A number of striking policy proposals:

a. The drawing up of a new structure plan/ urban management plan with sustainable development as the guiding principle.
b. The formulation of a structural vision for North-East Tilburg, with sustainable development as the central element.
c. The development of a number of new suburbs (Koolhoven East and West and Witbrant East and West) with sustainable development as the guiding principle.
d. Implementation of the structure plan for green space.
e. Ecological management of the public green spaces.

Example 2:
The "urban traffic" strategy for sustainability

Objectives:

1. No further growth in the number of kilometres driven by car within the town between 1990 and 2000.
2. In the same period, an increase in the number of bicycle trips by 20%, and:
3. A doubling of passenger numbers on public transport.
4. Stabilization of the environmental burden of traffic at 1990 levels.

A number of striking policy proposals:

a. The designation of car exclusion zones with parking on the perimeter.
b. The elaboration of transport plans for companies with more than 50 employees on two industrial estates, with the goal of reducing the number of kilometres driven (a reduction of some 20% would be feasible).
c. The drawing up of a business transport plan for the municipal staff, with the same goal.
d. Study into the feasibility of a shopping delivery service, for instance through a government employment scheme for the long-term unemployed.
e. Building of an extensive network of cycle paths throughout the town.
f. Reduction of the number of parking spaces in the town.

the reference points for arriving at more far-reaching environmental improvements.

The example of Philips Sound & Vision/Consumer Electronics

In a manner similar to the shifts in environmental policy in the public sector, industry is also gradually paying more attention to the integration of environmental policy with other aspects of the business.

Up to the end of the 1980s, industry focused mainly on incremental environmental improvements in production processes, first by taking curative, and later also through various preventive measures. The application of curative end-of-pipe technologies had no major organizational consequences for other parts of the business. The same applied, albeit to a slightly lesser extent, to incremental improvements to processes aimed at prevention. These latter improvements did, however, require a greater involvement by employees, for instance in ensuring that waste flows were indeed collected separately. But even these improvements could generally be achieved at the operational level, and did not require strategic decisions by senior management.

The more companies focus on product improvement, however, the greater the need for coordination with other parts of the company. Among trend-setting companies in particular, there has been a more specific focus on product improvement since the late 1980s. By using alternative, less environmentally harmful materials or substances, for instance, and by reducing the consumption of materials, these companies are producing environmental improvements in their products. Achieving such product improvements requires the involvement of more parties than in the case of the previously mentioned incremental improvements in processes. Within the company, there has to be coordination between the product designers and the purchasing and/or marketing departments. Furthermore, there has to be communication, and sometimes even cooperation, with other companies in the product chain (suppliers and customers, for example) (Cramer, 1996).

The further a company's environmental activities shift from incremental to far-reaching improvements at the product level, the more essential internal and external coordination becomes. Such improvements are generally more complex and more extensive in nature, both technically and organisationally. Taken to its extreme, environment is seen as one of the aspects which has to be taken into account when strategic decisions are being made by a company. Environment is then completely integrated in the company strategy (the "business") (IVA, 1995).

The developments in environmental policy outlined above are well illustrated by the example of Philips Sound & Vision/Consumer Electronics division.

In the 1970s and 1980s, the emphasis in the division's environmental policy was on incremental improvements, especially in its production processes. One of the major driving forces behind this was legislation and regulation, and the associated rules concerning licensing. Since the early 1990s, the focus has widened to encompass improvements in the consumer electronics products themselves. One of the reasons for this was the growing public pressure to find socially responsible ways of disposing of used consumer electronics goods. An additional factor was the realisation that environment-oriented product development usually led to win-win situations: environmental improvement and lower costs go hand in hand.

In recent years, the company has initiated numerous activities to improve its products from an environmental perspective. For instance, a major project is carried out to reduce the number of environmentally harmful products in consumer electronics products. One example of this is the decision to stop using flame retardants which contain bromide in the plastic housing of the televisions (which in contrast to other brands has been the case with Philips' televisions since 1987). A manual on environment-oriented product development ("eco-design") has also been produced for designers. The manual includes compulsory (environmental) rules for design. In addition, the company is actively seeking the best ways of designing consumer electronics products so that they can be processed as environmentally soundly as possible at the waste stage. For example, one improvement makes it possible to remove valuable materials more quickly and easily from the products. These can then be recycled with a higher yield and lower costs.

Initially the above product improvements were mainly incremental in nature. Gradually, the attention is now turning to more far-reaching and complex solutions, aimed at more far-reaching eco-optimization of existing products. To make recycling of consumer electronics products possible on a wider scale, for instance, it is now working on the next stages of eco-design. In that context, it has developed the concept of the "green television", which incorporates all the accumulated environmental know-how of the moment. This concept will be used as a reference for the future generations of the product.

The next step is to study the extent of potential positive or negative environmental effects of consumer electronics products of the future (which are now being prepared in the R&D laboratories). Philips Sound & Vision/Consumer Electronics is presently engaged in drawing up such strategies for sustainability. In the project "environmental aspects of consumer electronics in the long term", they are analysing the impact the environmental issue could have on the development of consumer electronics in the future. What opportunities or threats does this present for a company like Philips? What technological options are available for dealing as adequately as possible with environmental problems?

On this last point one could, for example, imagine diverse, partly complementary, technological options:

- minimizing energy consumption and the use of raw materials and toxic substances;
- further increasing material recycling;
- optimizing the life of the product (e.g. by recycling of the product or components or by technical upgrading);
- improving the efficiency of distribution of the product;
- finding alternative ways of performing the present function of the product.

On the basis of these various technological options, scenarios can be formulated to simplify the company's selection process. It is also important here to predict the policies the government will adopt. For instance, will it impose levies on energy and/or raw material consumption? Or will it set longer-term environmental requirements, for instance for recycling?

By including environmental aspects at an early stage in the product development, environmental performance can be improved. In this way, a company can act pro-actively rather than taking defensive, corrective measures. Such a form of integration of environmental aspects in product development presents opportunities for far-reaching improvement of production techniques. By taking environmental aspects into account at an early stage of product development, major improvements can be made in future consumer electronics products compared with the current range of products.

Such a long-term approach requires cooperation between the strategists of the Sound & Vision/Consumer Electronics division, the product developers, the marketing experts, the researchers and the environment specialists. Integrating environmental aspects with other aspects of business is essential. Internally, Philips is presently engaged in building up this collaboration.

The first efforts, like those taken by Philips Sound & Vision/Consumer Electronics, with respect to environmental aspects in the long term are still more the exception than the rule. It is principally the larger multinational companies that are beginning to move in this direction (IVA, 1995). This approach, however, could be the way forward to increasing eco-efficiency substantially. It is still uncertain whether increased efficiency on this scale can be achieved. First of all, concrete scenarios will have to be elaborated within Philips and tested for their environmental benefit. The eco-efficiency to be achieved will then depend on the strategic choices the company makes based on them. That may be a risk from the perspective of the desire for sustainability, but at the same time represents the challenge of this approach.

Conclusions

Far-reaching environmental improvements of existing processes, products and services or the design of entirely new product chains are needed if we desire to increase the eco-efficiency substantially and thereby take a large step towards a sustainable society. Achieving this objective will require a different way of thinking and behaving, both among environmental specialists and among people who have traditionally had little or nothing to do with environmental issues. In order to make strides forward in environmental benefit, environment must be integrated with other factors to

be taken into consideration.

One way of ensuring that environmental aspects are treated on their merits is to draw up strategies for sustainability. I am not arguing that this will automatically produce the right results in terms of improved eco-efficiency. After all, environmental aspects were previously in danger of being all too easily pushed into the background if economic interests were at stake. Furthermore, the filtration (in itself desirable) of environmental considerations in overall policy can lead to a relaxing of the standards for sustainability. Despite these reservations, I am calling for experimentation with the development of strategies for sustainability, since only by integrating the environmental aspect in the policies of government and business can we achieve far-reaching improvement in eco-efficiency. On the basis of two Dutch examples, I have illustrated how this approach can be elaborated. In order to test this approach, experiments should preferably not only be carried out in the Netherlands but also in other countries. The greater the involvement of various (local) government and companies, the sooner we will be able to assess the merits of the approach.

References

Arthur D. Little, *Sustainable Industrial Development: Sharing Responsibilities in a Competitive World*, Conference Paper, The Hague, 1996.

Cramer, J., Experiences with Implementing Integrated Chain Management in Dutch Industry, *Business Strategy and the Environment*, 5, No. 1, 1996, pp. 38-47.

Friends of the Earth Europe, *Towards Sustainable Europe*, Amsterdam, 1995.

Municipality of Tilburg, *Municipal Environmental Plan 2: 1995-1998: Working Together for a Sustainable City*, 2 volumes, Tilburg, 1995.

IVA (Royal Swedish Academy of Engineering Sciences), *Environmental Management: From Regulatory Demands to Strategic Business Opportunities*, Stockholm, Sweden, 1995.

Jansen, J.L.A. and Ph. J. Vergragt, Towards Sustainable Development with Technology: A Challenge from a Programmatic Perspective, *Milieu*, 8, No. 5, 1993, pp. 179-183.

Advisory Board of Transport, Public Works and Water Management, *Traffic and Transport on the Road towards Sustainable Development*, The Hague, 1995.

Schmidt-Bleek, F. et al., *Carnoules Declaration of the Factor Ten Club*, Wuppertal, October 1994.

Weterings, R.A.P.M. and J.B. Opschoor, *The Environmental Utilisation Space as a Challenge for Technological Development*, RMNO No. 74, Rijswijk, 1992.

Weizsäcker, E.U. von, A. Lovins and L. Lovins, *Faktor Vier: Doppelter Wohlstand- halbierter Naturverbrauch*, Droemer Knaur, Munich, 1995.

Jacqueline Cramer works at Philips Consumer Electronics as a senior consultant, detached from the Centre for Technology and Policy Studies (TNO). She is among other things vice-chairperson of the Advisory Board for Environmental Management (Raad voor het Milieubeheer) and member of the Advisory Board of Transport, Public Works and Water Management (Raad voor Verkeer en Waterstaat). She is also professor, occupying an endowed chair in Environmental Management at the Tilburg University. ◆

Cleaner Production

The Newsletter of the UNEP IE Cleaner Production Network dedicated to promoting cleaner production, the preventive environmental management strategy – applied to products, production processes, and services – that reconciles environmental protection and development.

No. 13
1997

Editorial

The Cleaner Production Declaration – the 1997-98 Policy Initiative

by J. Aloisi de Larderel, Director, UNEP IE

The Fifth High Level Cleaner Production Seminar, to be held in Korea in September 1998, will mark the tenth anniversary of the UNEP IE Cleaner Production Programme. In the past ten years the concept and application of CP have spread both geographically and sectorally. The informal CP network now consists of 188 CP centres and activities in 61 countries. This number will certainly increase before the seminar is held next year.

Policies and strategies for implementing CP at the local, national and international levels have also evolved during the past ten years. Trends have emerged indicating what works and what does not work in implementing CP (see boxes on the Oslo and Bangkok CP Roundtables).

It is clear that a framework for international CP policy needs to be established. There is a perception that CP is driven more by donors and suppliers, rather than in response to demand from business. And the transition from donor/supplier dependency to self-motivated action is still very slow in many countries.

Without a commitment from all stakeholders – in government, business, and elsewhere in civil society – CP could be in danger of remaining just a good idea rather than becoming a practical strategy for achieving sustainable production and consumption. There is a need to apply this fundamentally simple and rational strategy at a global level through a concerted effort led by business, political and other leaders.

An international declaration is one mechanism for creating greater awareness and, consequently, greater demand. Initially suggested by the US National Pollution Prevention Roundtable, the goal of such a declaration would be to generate new initiatives, investments and partners, facilitating the move into a new era for CP. In 1997 and 1998, before the Korea meeting takes place, UNEP is therefore working in partnership with other organizations to collect regional input on the status of CP implementation, as well as to collect feedback and establish support for this declaration. Additional meetings are anticipated in South America, Southern Africa, and the Mediterranean regions.

Like other declarations, this document will set out a number of guiding principles that underpin voluntary commitments, such as recognition of the need to address environment using a multi-media or holistic approach, with CP as the priority strategy within the environmental management hierarchy, and to include various stakeholders in the promotion of CP.

Following this iterative, participatory process, the declaration will be launched at the time of the Korea meeting with the signature and endorsement of UNEP's Executive Director and a high-ranking Korean official. Signatures from other leaders in government, industry and NGOs will then be solicited.

UNEP IE Internet address: icpic@unep.fr
UNEP IE World Wide Web address: http://www.unepie.org

4th European Roundtable

The 1997 European Roundtable met in Oslo, Norway, in November 1997. With many of the 350 delegates from industry, the Roundtable was regarded as a "milestone" on the road from "Sofia (UNECE meeing in 1995) to Aarhus" (the next meeting of OECD and European Environment Ministers in Aarhus, Denmark, in 1998.)

Three principal areas were addressed:

- the contribution of industrial ecology to CP;
- how to move from supply-driven to demand-driven activity in CP;
- the need for national policy reform to foster CP.

Among the conclusions, delegates cited the need for: realistic resource pricing, regulations to specify goals rather than prescriptive technical solutions, and widespread application of economic incentives for adopting CP. Financial mechanisms, preferably revolving funds, should be set up to provide financing for CP initiatives, and donors and the financial sector should work to make CP assessments a precondition for investments. The Roundtable strongly recommended that material and monetary flows be analysed together.

For more information, contact UNEP IE.

First Asian and Pacific CP Roundtable Meets in Bangkok

The First Asian and Pacific Roundtable on Cleaner Production was held in November 1997 in conjunction with the International Conference and Exhibition on Pollution Control in Bangkok. Both end-of-pipe and cleaner production issues were discussed. Parallel sessions addressed the themes of technology, policy and regulations, and business and international trade.

The Roundtable was significant for the number of successful regional case studies presented. At a session on the above-mentioned draft international declaration for cleaner production, the initiative gained widespread support.

Since the next Asian Roundtable is planned for Brisbane, Australia, in 1998, it was fitting that the Australian Deputy Minister for the Environment officially closed the Bangkok proceedings.

UNITED NATIONS ENVIRONMENT PROGRAMME INDUSTRY AND ENVIRONMENT

39-43 QUAI ANDRE CITROEN
75739 PARIS CEDEX 15 FRANCE
TEL.: 33 (01) 44 37 14 50
FAX: 33 (01) 44 37 14 74
E-MAIL: unepie@unep.fr
http://www.unepie.org

UNEP
For Life on Earth

EDITOR:
Garrette Clark

EDITORIAL BOARD: J. Aloisi de Larderel, J. Hobbs, D.W. Shin, U. Abrahamsen, K. Elvebakken and R. Tu

The editor welcomes all news on cleaner production from readers. Please send to UNEP IE.

OECD and UNEP join forces for a CP Declaration

A partnership has been established between UNEP's Cleaner Production Programme and the Non-Member Countries Branch of the OECD's Environment Directorate in the formulation of two closely-related international initiatives.

OECD, through its role as the Secretariat for the Task Force to Implement the Environmental Action Programme in Central and Eastern Europe (EAP Task Force) is a strong advocate of CP in this Region. CP is regarded as an important instrument for assisting these countries in their transition to market economies. To facilitate this exercise, OECD is developing a Ministerial Policy Statement on Environmental Management in Enterprises. The policy statement incorporates guidance on the policy frameworks and capacities required to promote more effective environmental management in enterprises in these countries.

At first glance this may appear to conflict with UNEP IE's initiative to develop an International Declaration on Cleaner Production. Apart from the difference that the OECD's focus is on Eastern Europe, UNEP is working on a multi-stakeholder declaration of broad principles, whereas the OECD is focused on how to put such principles into practice. The two initiatives are thus mutually reinforcing.

The Policy Statement, which was endorsed by the EAP Task Force in November 1997 will be launched at the Aarhus "Environment for Europe" Ministerial Conference in June 1998. The UNEP declaration will be launched in September 1998 at the Fifth High Level Seminar on Cleaner Production to be held in Korea.

For more information, contact UNEP IE or:
Mr Brendan Gillespie
Non-Member Countries Branch
OECD Environment Directorate
2 rue André-Pascal
75775 Paris Cedex 16, France
Tel +33 1 45 24 93 02
Fax: +33 1 45 24 96 71
http://www.oecd.org/env/eap

NCPC Directors Meet in Thailand

The purpose of the third Annual Meeting of the Directors of the UNIDO/UNEP National Cleaner Production Centres (NCPCs) (Bangkok, November 1997), was to review Phase I of the Programme and discuss the strategy for Phase II. Considerable success has been achieved in building CP capacity in the countries and regions of the ten national centres (Brazil, China, Czech Republic, Hungary, India, Mexico, Slovakia, Tanzania, Tunisia and Zimbabwe).

Sessions addressed NCPC funding, Information Management Systems, CP policy initiatives, the roles of UNIDO and UNEP in strengthening NCPCs, the marketing of NCPCs, evaluating the performance of NCPCs, developing better business plans, and innovative new areas including better linkages with EMS developments.

Counterparts from Austria, the Netherlands, Denmark and Norway, as well as representatives from the Swiss development aid agency BAWI, the Netherlands Management Cooperation Programme, and UNIDO's regional offices in Costa Rica, Mexico and China, also participated.

Conclusions included recognition of the successes in disseminating the CP message, and of the value of a strong network of dedicated people. The network will double in size during Phase II activities. The role of existing Phase I Directors as mentors and advisers will increase.

For more information, contact UNEP IE.

Cleaner Production Network

The Cleaner Production Programme has identified more than 180 cleaner production centres and activities located in 61 countries throughout the world. One of the aims of the Programme in 1998 is to formalize and recognize this network as a valuable tool to help promote cleaner production. Current activities of UNIDO/UNEP NCPCs and other network members will be regularly highlighted in the CP Newsletter.

Asia

Green Productivity and Cleaner Production Concepts Synergize in Bangkok

In June 1997, UNEP IE and the Asian Productivity Organization (APO) signed a Memorandum of Understanding (MoU) to work together to disseminate information and build CP and green productivity capacity through their respective networks. APO, an inter-governmental agency based in Tokyo, has recently expanded its definition of productivity to include "green productivity", which is in practice very close to CP. Further to the MoU, a joint workshop was held in Bangkok with several NCPC Directors, UNEP IE Working Groups and representatives of the 18 APO-affiliated National Productivity Centres.

APO sought the expertise of the NCPC Directors to guide expansion of its environmental programme. The mutual benefits for promoting and consolidating the CP/green productivity message were recognized by delegates, who confirmed that this partnership represents a significant advance in promoting CP in Asia.

Australia

EcoReDesign 2: New opportunities in the competitive market for greener products

The National Centre for Design at the Royal Melbourne Institute of Technology is launching the second stage of its ecodesign programme targeted at small and medium-sized companies. The first phase of this assistance programme enabled companies to identify product design, materials and business options for future improvement. The second stage offers a booklet introducing EcoReDesign, a series of seminars targeted to specific industry sectors, and a company assistance programme. The second stage focuses on energy efficiency, water consumption, toxic raw materials, and end-of-life reuse and recycling. Overall, the project focuses on business's demand to take environment into account in regard to internal and exporting markets.

National Centre for Design,
RMIT
GPO Box 2476V
Melbourne, Victoria 3001
Australia
Tel: +61 (0)3 9660 2362
Fax: +61 (0)3 9639 3412
email: mcfd@rmit.edu.au
http://www.cfd.rmit.edu.au/dfe/edps.html

清洁生产简讯

China

UNIDO/UNEP National Cleaner Production Centre

The Centre has carried out or participated in a number of workshops, including the following:

- In cooperation with the Hong Kong Productivity Council, UNIDO and UNEP IE, the Centre held an Environmental Auditors Course which integrated EMS and CP Training.
- There were CP workshops in Lanzhou City, Inner Mongolia Autonomous Region, at the Anshan Iron and Steel General Corporation, Huaihe River, in the pulp and paper industry, and in Shaanxi Province.

The Centre also developed computer software for CP auditing in the electrical industry. In the policy and strategies area, the Chinese National Environmental Protection Agency published a document, **Several Ideas on Promoting CP**, in April 1997. This document is important because it is the first official national policy statement on CP.

For more information, contact the China NCPC (see address below).

Indonesia

Indonesia's Environmental Impact Management Agency, BAPEDAL, has produced a number of publications that present the national policy on CP as well as providing Indonesian CP examples. The documents, **Cleaner Production Action Plans** and **Cleaner Production in Indonesia**, are available from BAPEDAL.

For more information, contact:
Directorate for Technical Development
Deputy for EIA and Technical Guidance
BAPEDAL
Arthaloka Building 6th Floor
Jl. Jenderal Sudirman No. 2
Jakarta 10220, Indonesia
Tel/Fax: +62 21 251 2459

Thailand

The Project on Promotion of Cleaner Technology in Thai Industry

In response to a lack of CP awareness and know-how, the Thailand Environmental Institute and the Federation of Thai Industries have initiated a project on "Promotion of Cleaner Technology in Thai Industry" specifically aimed at small and medium-sized industries in the electroplating, textile and food industries, which are major polluters. The five-year project, initiated in May 1996, has received the support of the Danish Cooperation on Environment and Development (DANCED).

A number of training activities and resources management audits will be organized for industries, and model audits will be performed in each targeted industry sector. In addition, a Cleaner Technology Information Centre has been established to provide support. For more information, contact:

Mandar Parasuis
Cleaner Technology Information Centre
Thailand Environment Institute
59/27 Soi Sampobnarumit, Sukhumvit 62
Prakanong, Bangkok 10260, Thailand
Tel: +662 741 6350-7 (ext. 200)
Fax: +662 741 6361
email: ctic@tei.or.th

Europe

The Czech Republic

The NCPC has identified a "Basic Capacity Level for CP" in the Czech Republic, but holds that barriers, including the predominance of an end-of-pipe ethic and a lack of commitment in industry, impede further success. Basic capacity consists of two CP centres, training materials adapted to the Czech situation in the local language, integration of CP in the curriculum of three universities, and the development of a monitoring and quality assurance system.

Ongoing projects include a CP/EMS integration project under which, with Austrian financing, a demonstration project is underway at a small wine producer. Another CP/EMS project, supported by the UNIDO/UNEP NCPC Programme, will be completed by the end of 1997.

For more information, contact the Czech NCPC (see address below).

Poland

With the completion of the 31st CP School training programme (each session training 25-30 companies), a total of 1025 cleaner production experts from 512 manufacturing companies and 240 service sector companies have been trained. Over 125 companies have applied for a CP Company Certificate showing that they have introduced an environmental management system based on a the CP strategy. As a result of the programme, projects have been initiated, resulting in environmental load reductions of electricity use, heat and water consumption, and disposal of solid and gaseous waste and wastewater. Total savings are in the order of US$ 4.5 million per year.

For more information, contact:
Polish Cleaner Production Centre
Polish Federation of Engineering Associations
ul. Krasinskiego 13,
40-019
PO Box 1388
Katowice, Poland
Tel/fax: +4832 256 55 07

Working Group on Policies, Strategies and Instruments Hosts New Horizons in CP Seminar, Sweden, October 1997

Once in a while, it is necessary to reconsider the "vision" of CP. A Seminar hosted jointly by UNEP IE and Lund University was held on 22-23 October 1997 at Trollenholm Slott, Sweden. Participants agreed that the dynamic early growth of CP has now slowed to one of consolidation. New partners, new directions, and more diverse responses are required if the challenges ahead are to be successfully addressed. A better marketing strategy is needed to attract new partners and reach key decision-takers.

Participants confirmed that CP can now be considered to have "arrived" at a more mature, stable period than in the past as a professionally driven reform movement. Technical assessments and demonstrations will remain important core activities. Without a conducive structural environment, however, they will not bring about the major reorientation that sustainable production and consumption requires.

For more information, contact UNEP IE.

Slovak Cleaner Production Activities

In 1997, the Slovak NCPC carried out a number of training and technical assistance projects including regional projects, a sectoral project in the food industry, and an EMS/CP project. The Centre also sponsored a number of conferences and seminars. These included the Second Slovak ☞

UNEP IE Cleaner Production Information update

ICPIC diskette Version 3. Available in January 1998, the diskette is in the Windows™ format and contains more case studies, publication abstracts, and an updated listing of experts. The ICPIC databases will also be available on UNEP IE's World Wide Web page (http://www.unepie.org) in February 1998.

CP Information Sources. UNEP IE has published a listing of CP information sources. The document contains the following specific types of CP information: centres and activities worldwide, relevant World Wide Web sites, periodicals, training courses and curricula, and audio visuals.

ECODESIGN Manual. This manual provides companies with a step-by-step approach to ecodesign.

Written jointly by UNEP, the Rathenau Instituut, and Delft University of Technology, it addresses the issue of product development and offers a methodology to companies who want to get involved with ecodesign. The modular structure of the manual allows a company to gain experience in the field of ecodesign, and then to tailor the initial step-by-step approach to set up an ecodesign programme suited to its own situation and needs.

☞ Cleaner Production Conference, a conference on the Glass Industry and Environment, and five short-term CP training initiatives. In the area of information dissemination, the centre launched its World Wide Web page, making many of its documents available, and started a library for hardcopy CP information. A policy study on available "Environmental Project Financing Mechanisms in Slovakia", which includes existing sources, an analysis of current trends, and recommendations for developing financing models in Slovakia, was completed.

For more information, contact the Slovak NCPC (see address below).

South America

Mexico

In April 1997 the Mexico NCPC, in collaboration with other cleaner production initiatives, published **Cleaner Production – Experiences in the Metal Plating Industry** (in Spanish), which highlights the results of six demonstration projects. Each case study includes a description of the company and its production process, CP opportunities, and an analysis of the financial, efficiency, and environmental benefits.

For more information, contact the Mexican NCPC (see box opposite).

Africa

Tanzania

The NCPC continued the implementation of various in-plant cleaner production demonstration projects. Most of the projects are at the option-generating stage. The Centre has also been involved in a UNIDO-sponsored workshop on Ecologically Sustainable Development for East African Countries (Kenya, Uganda, Tanzania and Zambia). In addition, in October 1997 the Centre hosted the first public meeting, including representatives from industry and government, to disseminate the results of demonstration projects.

For more information, contact the Tanzania NCPC (see box opposite).

CP Team Update

In September 1997, Mr T.U. Ruihe joined the Cleaner Production Programme as a senior consultant seconded by the Chinese government. Mr Ruihe is a senior project officer and an assistant professor at the China National Environmental Protection Agency, with a master's degree in occupational safety engineering and experience in EIAs.

UNEP Cleaner Production Contacts

Director
UNEP Regional Office for Africa (ROA)
United Nations Avenue, Gigiri
P.O. Box 47074
Nairobi, Kenya
Tel: (254 2) 521840/ 521841
Fax: (254 2) 623928
E-mail: maria.deAmorim @unep.no

Mr Mark Radka
Industry Officer
UNEP Regional Office for Asia and the Pacific (ROAP)
United Nations Building,
10th Floor
Rajdamnern Avenue
Bangkok 10200, Thailand
Tel: (662) 2881679
Fax: (662) 2803829
E-mail: radka.unescap@un.org

Director
UNEP Regional Office for Europe (ROE)
15 Chemin des Anémones
1219 Châtelaine
Geneva, Switzerland
Tel: (41 22) 9799111
Fax: (41 22) 7973420
E-mail: Halders@ unep.ch

Director
UNEP Regional Office for North America (RONA)
Room DC2-803,
2 United Nations Plaza
New York, N.Y. 10017
U.S.A.
Tel: (1 212) 9638138/8139
Fax: (1 212) 963414/6 or 9637341
E-mail: hart@un.org

Mr Leo Heileman
Industry Officer
UNEP Regional Office for Latin America and the Caribbean (ROLAC)
Blvd de los Virreyes n° 155
Lomas Virreyes 11000
DF, Mexico
Tel: (52 5) 2026913/2024841/ 2024955/2027529
Fax: (52 5) 2020950
E-mail: uneprolac@igc. apc.org

Director
UNEP Regional Office for West Asia (ROWA)
P.O. Box 10880
Manama, State of Bahrain
Tel: (973) 276072/276073
Fax: (973) 276075

National Cleaner Production Centres

NCPC Brazil
Carlos Adilo Maia do Nacimento, Director
SENAI
Av Assis Brasil 8450
91140-000 Porto Alrgre
Rio Grande do Sul, Brazil
Tel: +555 13 478848
Fax: +555 13 478849/3400811
E-mail: ncpc@nutecnet. com.br

China NCPC
Ning Duan, Director
Chinese Research Academy of Environmental Sciences
Anwai Beiyuan
Beijing 100012
People's Republic of China
Tel: +86 10 4232255 ext 233
Fax: +86 10 4232542
E-mail: emicraes@ns.east. cn.net

Czech NCPC
Vladimir Dobes, Director
PO Box 1113
Politicych veznu 13
111 21 Prague 1
Czech Republic
Tel: +42 2 2423 or +42 2 260 620 Fax: +42 2 260 639
E-mail: czechcpc@czn.cz

Hungary NCPC
Sandor Kerekes, Director
Budapest University of Economic Science
Fovam ter 8
Hungary
Tel: +36 1 217 9588
Fax: +36 1 2188076
E-mail: skerekes@ Pegasus.bke.hu

India NCPC
S.P. Chandak, Director
Utpadakta Bhavan
Lodi Road
New Delhi 110 003
India
Tel: +91 11 4611243 or 4625013
Fax: +91 11 462 5013
E-mail: ncpc@del2.vsnl.net.in

Mexico NCPC
Susana Hurtado Baker, Director
Avenida Politecnico s/n
Edificio 9 de Laboratorios Pesados
Unidad Profesional Adolfo Lopez Mateos
Zacatenco, 007738 Mexico, DF, Mexico
Tel: +525 729 6202
Fax: +525 729 6201
E-mail: Shurtado@vmredipn. ipn.mx

Slovak NCPC
Viera Feckova, Director
Pionierska 15, 831 02
Bratislava
Slovak Republic
Tel/Fax +421 7 259 015
E-mail: scpc@chtf.stuba.sk
http://www.ic1.chft.stuba.sk/ CPC/

NCPC Tanzania
C.L.C. Migiro, Director
Tanzania Industrial Research and Development Organization
PO Box 23235
Dar-es-Salaam
United Republic of Tanzania
Tel: +255 51 668105/668979
Fax: +255 51 668 147
E-mail: cpct@udsm.ac.tz

Centre de Production Plus Propre
Rachid Nafti, Director
Colisee Soula,
Escalier D 2e etage
2092 El Manar II
Tunisia
Tel: +216 1 872 688
Fax: +216 1 872 688
E-mail: cp3@cp3.com.tn

Zimbabwe NCPC
Lewin Mombemuriwo, Director
c/o UNIDO Office
67-69 Union Avenue
PO Box BW 1635
Borrowdale, Harare
Zimbabwe
Tel:+263 4 731779
Fax: +263 4 731 1779
E-mail: cpczim@harare.iafrica.com

UNIDO
NCPC Programme Office
Environment and Energy Branch
Industrial Sectors and Environment Division
Vienna International Centre
PO Box 300
A-1400 Vienna, Austria
Tel: +43 1 211310
Fax: +43 1 211316803
E-mail: ncpc_env@unido.org
http://www.unido.org

NCPC Programme Office
UNEP IE
Tour Mirabeau
39-43 quai André-Citroën
75739 Paris Cedex 15
France
Tel: +33 1 44 37 14 50
Fax: +33 1 44 37 14 74
E-mail: unepie@unep.fr
http://www.unepie.org

Activities and programmes reported in this newsletter are provided for information and do not necessarily represent the policy of UNEP.

Environmental Technology Assessment

No. 6, 1997

R&D – a social responsibility

In the early nineties, the Flemish authorities decided to create an autonomous institute to cover the non-nuclear activities of the National Nuclear Research Centre. Today, the Flemish Institute for Technological Research (VITO) is one of Belgium's leading multi-disciplinary research centres in the areas of energy, environment and materials, with a staff of over 400.

From the outset, Technology Assessment (TA) was introduced into the research programmes to match technological research with important societal aspects such as environment, safety, health, and public perception. The impetus behind this coupling was to link VITO's work with a role of social responsibility. The objectives of using TA were: to steer projects; to identify technological and societal research needs; and to assist public policy or potential users in regard to socio-technical choices. This coupling led to the evolution of several research groups, each with their own expertise: for example, product and process; evaluation (life cycle analysis and ecodesign); risk assessment in biotechnology; research on alternative motor fuels; and global change research.

In order to have TA as a mature support activity for setting internal R&D policy, VITO has chosen to develop TA systematically as an instrument that could be combined with R&D. Using a conceptual approach called Integrated Technology Assessment (ITA), TA is integrated into R&D projects, with researchers and research managers performing the assessment themselves. The added value of this integrated approach is that ITA increases the social responsibility of the researchers.

Through its work, VITO has demonstrated that ITA can be used most successfully as an instrument for socially responsible, cost-efficient R&D management. It is well documented that errors in R&D planning can be costly, particularly if social criteria are not taken into consideration. Incorporating ITA into R&D means that the feasibility of a product or process is continually assessed from both economic and social viewpoints. With ITA, "successful innovation" is not defined solely by commercialization or market penetration but also in terms of meeting social criteria, i.e. being environmentally sound, sustainable, safe, etc. Integrating ITA into R&D therefore stimulates the development of products and processes that are both economically viable and socially responsible.

For more information about VITO and its work with UNEP and other organizations, please contact:

Robert Berloznik, Project Manager
Technology Assessment
Flemish Institute for Technological Research (VITO)
Boeretang 200
B-2400 Mol
Belgium
Tel: 32.14.33.5934
Fax: 32.14.32.1185
E-mail: berloznr@vito.be

Workshop Session Design

A major part of UNEP IE's EnTA activities involve EnTA demonstration workshops. Based on IE's workshop experience, we have compiled a list of recommendations to help others in designing similar workshop sessions.

1. Understand participants' backgrounds.
It is important to have a good understanding of people's professional backgrounds, so that the information content of the workshop can be tailored accordingly. Information that is too difficult for participants to understand, or unrelated to their work, will hinder their ability to see how the EnTA process can be applied to their own field.

2. Specify the EnTA decision-making application.
EnTA can be used in a variety of ways: to help select an appropriate technology in a production process; to indicate whether a process conforms to regulations or codes; to assess whether a particular industry is suitable for a particular location (e.g. industrial estate, etc.) Although the structure of the assessment process itself does not change, the types of information needed to perform the assessment vary. Understanding the context in which EnTA will be used in the participants' work will help define the type of EnTA application that should be used.

3. Design a simplified exercise packet and worksheets.
It is important for participants to be able to complete the EnTA process during the workshop, when experts are available to help with

continued ▸▸

UNEP
For Life on Earth

INDUSTRY AND ENVIRONMENT
DIRECTOR: Jacqueline Aloisi de Larderel
EDITOR: Laura E. Williamson
39-43 QUAI ANDRE CITROEN
75739 PARIS CEDEX 15 FRANCE
TEL.: 33 (01) 44 37 14 50
FAX: 33 (01) 44 37 14 74
E-MAIL: unepie@unep.fr
http://www.unepie.org

INTERNATIONAL ENVIRONMENTAL TECHNOLOGY CENTRE
DIRECTOR: John Whitelaw
PROGRAMME CO-ORDINATOR: Christian H. Strohmann
2-110 RYOKUCHI KOEN
TSURUMI-KU
Osaka 538, JAPAN
Tel: 81 (6) 915 4583/84
Fax: 81 (6) 915 0304
E-MAIL: ietc@unep.or.jp
http://www.unep.or.jp

questions. Unless participants are already familiar with EnTA, it is best to simplify the worksheets and address only the key issues. Too much detail tends to create confusion and cause frustration.

4. Prepare relevant background notes on the technology, the technology sector, and any relevant additional technical information.
A major part of the EnTA process is describing a technology and possible alternatives. An overview of the technology and relevant sector(s) is therefore necessary in order for participants to complete the worksheets and should be tailored to their level of comprehension. This can be difficult when the participants have varied professional backgrounds. In this instance, it is better to tailor the information to suit those who are the least knowledgeable about technical issues or use "advanced" and "basic" streams.

5. Send out a briefing note, worksheets, and selected background information.
To prepare participants for the workshop, it is advisable to send out a pre-workshop packet. This packet should contain an overview of the EnTA process, worksheets, technical and environmental information, and an explanation of how the information and worksheets will be used.

6. Brief tutors, resource persons and translators.
It is important that all personnel involved understand the workshop's goal(s) and how it will proceed. If different languages are involved, an orientation meeting should be held with the translators so that they can familiarize themselves with EnTA concept, terminology and process as well as ask questions. Poor translation can severely compromise the efficacy of a workshop.

7. Discuss the results of the exercise afterwards.
An informal discussion at the end of the session allows participants to ask further questions and provide instructors with feedback. Participants should be encouraged to discuss how they foresee using EnTA in their work. This is also a good time for people to discuss possible future cooperation.

For further information about EnTA workshop session preparation, please contact Laura Williamson at UNEP IE. ■

Test Your Knowledge – EnTA Quiz

Circle the correct answer

❶ Environmental Technology Assessment (EnTA) is the assessment of environmental technologies.
True **False**

❷ EnTA is an environmental management tool.
True **False**

❸ EnTA can be used to:
a) complement an EIA
b) assess a technology
c) aid in policy formation
d) all of the above

❹ EnTA is used by:
a) engineers
b) NGOs
c) business
d) government
e) all of the above

❺ The role of EnTA is to provide qualitative information about a technology.
True **False**

❻ To perform an EnTA, it is necessary to have information on:
a) the costs of the technology
b) the environmental effects of the technology
c) resource inputs and outputs
d) energy inputs and outputs
e) the social context in which the technology is to be used
f) technology options
g) all of the above

❼ EnTA is a valuable tool for technology importers.
True **False**

❽ The extent and level of detail of an EnTA is always the same, regardless of what is being assessed.
True **False**

Answers

❶ **False.** EnTA is the assessment of any technology from an environmental perspective. The technology is examined for its potential environmental impacts – both positive and negative. "Environment" in this sense also includes the potential social and health impacts of the technology.

❷ **True.** EnTA is one of several environmental management tools used for improving decision-making, with the overall aim of improving the environmental performance of industry. Others include Life Cycle Assessment (LCA), Environmental Impact Assessment (EIA), etc.

❸ d) EnTA can be used at the micro- or macro-level. At the micro-level, it can be undertaken as the assessment of a particular technology or as part of a larger industrial project evaluation, such as complementing an Environmental Impact Assessment (EIA). At the macro-level, EnTA contributes to policy formation by allowing policy-makers to look at possible consequences of a particular technology process such as car manufacturing, in comparison with another options.

❹ **e)** EnTA can be used by anyone wishing to assess a technology's potential effect on the social and ecological environments.

❺ **True.** EnTA is a descriptive process that highlights the advantages and disadvantages of a particular technology and associated options. These are then measured against defined criteria. (Criteria are set by the user, not by the EnTA process.)

❻ **b), e), f)** An EnTA relies on information about the technology, and the ecological and social context in which it is to be used. Information about technology options is also important to the EnTA process. It is only by comparing the social and environmental effects of various technologies that the user can make an informed decision about the most appropriate technology to use.

❼ **True.** Performing an EnTA on a potential import helps the importer to see what impacts the technology may have on the local "environment", e.g. infrastructure, social issues, environment, etc. The alternative technology option section of EnTA also encourages importers to think of other options which in some cases may be more suitable.

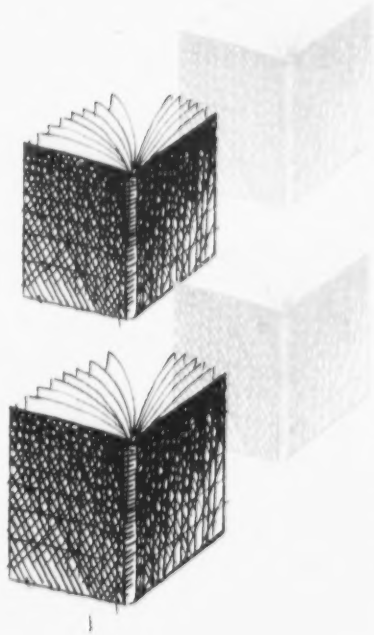
❽ **False.** The scope, extent and level of detail of an EnTA depend on the purpose for which it is used, the needs of the user, and the information, resources and expertise available.

New Publication

Retooling Impact Assessment for the New Century

The Army Environmental Policy Institute (AEPI) of the Georgia Institute of Technology in Atlanta, Georgia, USA, has initiated an annual update on (environmental) impact assessment methods. The aim is to provide concise reviews of current state-of-the-art methods, in particular methodology and current developments in assessment and foresight analyses. The review should serve to alert practitioners to methodological advances and help students understand current methodological issues.

The two editors, Alan Porter and John Fittipaldi, in collaboration with the International Association for Impact Assessment (IAIA), the National Association of Environmental Professionals (NAEP), and the Ecological Society of America (ESA), have selected a number of assessment experts to write review articles on subjects such as assessment overviews, macro assessment, processes, risk assessment, domain-oriented impact assessment, and models in environmental impact assessment. Among the contributions compiled for this publication is "Training Approaches in Environmental Technology Assessment (EnTA)", which describes the capacity-building efforts of the joint UNEP IETC/UNEP IE EnTA programme.



The review is free of charge to those who want to learn more about assessment methods. Editors and authors alike hope that the "Methods Review" will help to improve the practice of environmental and impact assessment, and stimulate further advances in their developments.

For more information, contact Alan Porter at:
Fax: 1.404.892.9381
E-mail: aporter@isye.isye.gatech.edu ■

Meeting Update

On 26-28 May 1997, UNEP's IE and IETC offices convened the second international *Expert Meeting on Information Systems Related to Environmentally Sound Technologies (ESTs).* Participants shared experiences and ideas on information dissemination, in particular on how to improve information exchange with key users such as intermediaries and UN Convention Secretariats and Action Programmes.

Through discussions and working groups, participants agreed to:

1. **improve the description of technology-specific information to go beyond single-issue analysis and include key environmental criteria.** This information should address the important environmental issues outlined in international Conventions and Action Programmes, such as the generation of hazardous waste (Basel Convention), production of ozone depleting substances (Ozone Convention), use or production of chemicals (Chemicals Action Programmes), etc.;
2. **establish a "checklist" of environmental criteria** (based on point 1 above) to help guide information systems in expanding this description of available technologies;
3. **not reinvent the wheel,** but build on existing information systems;
4. **create a network of networks,** to enable information systems to exchange information and experiences.

A number of participants agreed to participate in a dedicated e-mail **listserv**, in order to continue discussions on cooperation and coordination in regard to information dissemination. Current discussions are on how to include environmental criteria in technology descriptions.

For a copy of the final report or information on the listserv, contact Laura Williamson at UNEP IE.

Workshop Update

On 27-30 May 1997, the Municipal Government of Wuhan hosted a UNEP IETC leadership training workshop for Chinese local government officials on Environmental Technology Assessment (EnTA). The workshop focused on utilizing EnTA as a decision-making tool for the adoption of Environmentally Sound Technologies (ESTs), particularly wastewater management technologies, for the management of large cities.

This workshop also represents the first step in implementing the recently concluded agreement between the Government of China and UNDP on assistance for the cities of Wuhan and Shenyang under the Sustainable Cities Programme. As examples of environmental degradation in China's industrial cities, Shenyang and Wuhan are keen to become showcases of modernization with strong environmental awareness.

For more information on the workshop, contact Toru Tamura at IETC. ■

The UNEP IETC representative, Mr. Toru Tamura, during his pesentation at the EnTA workshop in Wuhan, China (photo: IETC)

Letter To The Editor

Greetings from Swaziland. Hope you can recollect our meeting at the Environmental Technology Assessment (EnTA) training workshop held at Potchefstroom in South Africa, late November 1996. *(Editor's note: please see EnTA newsletter No. 5 for information on the workshop.)* In the follow-up to this workshop, I gave a couple of lectures to university students on EnTA-related issues. I have also used a lot of the EnTA material for teaching core courses in the social sciences. Indeed, the workshop that UNEP IE and IETC organized was very useful and an eye opener for scientists and NGOs working in the field of development. I believe students who are leaders of tomorrow have got to become aware of environmental issues.

R. Mathew
Dept. of Sociology
University of Swaziland
Pvt/Bag Kwaluseni
SWAZILAND
Fax: 268.85276

Address Change

The International Association for Technology Assessment and Forecasting Institutions (IATAFI) has recently moved from STATOIL in Sandsli to offices in the European Office of the Hordaland Fylkeskommune. Their new contact information is:

IATAFI
c/o Hordaland Fylkeskommune
European Office
N-5020 Bergen, Norway
Tel: 47.5523.9534
Fax: 47.5523.9379
E-mail:iatafi@iatafi.no
Web: www.iatafi.no

World News

Meeting of the International Energy Agency Governing Board at Ministerial Level endorses Statement on the Energy Dimension of Climate Change

The Governing Board of the International Energy Agency (IEA) met at ministerial level in Paris on 23 May 1997. The ministers recognized that the use of energy has been decisive in economic development but has also resulted in increased carbon dioxide (CO_2) emissions from the consumption of fossil fuels. The most pressing challenge facing the IEA today is, therefore, to devise and implement energy policies that are achievable and cost-effective and which will help to achieve the greenhouse gas emission limitations and reduction objectives which seem likely to be agreed in December 1997 at the third session of the Conference of the Parties (COP-3) to the United Nations Framework Convention on Climate Change (UNFCCC) in Kyoto, Japan.

The ministers agreed that emission limitations and reduction objectives will have important implications for energy producers, consumers and energy markets generally, and that energy policy makers must play a significant role in meeting the challenge posed by climate change and in defining the elements for agreement at COP-3. In this context, they endorsed the "IEA Statement on the Energy Dimension of Climate Change", submitted earlier this year to the Ad Hoc Group on the Berlin Mandate under the UNFCCC. The Statement, designed to help participants to prepare for the COP-3 negotiations, describes the main energy aspects of the climate change issue and spells out some cost-effective and viable energy responses to it.

The Statement begins by underlining the importance of working with market dynamics to find viable solutions. It is market dynamics, including the rigidity of infrastructures and attitudes, and the rate of capital stock turnover which define the basic parameters of viable response options.

The structure of energy markets and pricing policies are also areas where effective solutions can be sought. The current trend in market deregulation in IEA countries will provide a more level playing field which, while it will not of itself promote lowering of greenhouse gas emissions, will provide a more effective basis for actions aimed at doing so.

End-use prices are recognized as a strong determining factor for energy consumption trends. Sectoral analysis shows, in each end-use market, an inverse relationship between average energy prices and consumption per unit of GDP. This indicates that prices do influence consumers in selecting equipment and infrastructures, and in their use of energy. Instruments affecting prices therefore provide a direct lever on consumption patterns.

In examining the contribution of technology, the Statement points out that there are a variety of options available which could help to reduce CO_2 emissions while maintaining the same level of service provision. More efficient fossil fuel technologies (e.g. cogeneration), renewable energy and large-scale hydro sources are mentioned. Similarly, where the transport sector is concerned, electric, hybrid and hydrogen vehicles are becoming available, although at different levels of commercial viability. Cleaner and more efficient technologies for energy production and end-use could contribute to reducing emissions. However, if ongoing technological progress is to be ensured, there is a need for commitment to long-term investment in research and development.

The Statement also discusses the effectiveness of instruments such as efficiency standards and tradeable permits and ends by stressing the need for cooperative action between countries.

The report on the Meeting of the Governing Board at Ministerial Level and the International Energy Agency Statement on the Energy Dimension of Climate Change are available from: International Energy Agency, 9 rue de Fédération, 75739 Paris Cedex 15, France. Tel: +33 (01) 40 57 65 54, Fax: +33 (01) 40 57 65 59. ◆

Unlocking Trade Opportunities – finding pathways to sustainable consumption

In the increasingly global economy, export success can be an important route to economic progress for developing countries. However, producers are facing changing conditions as environmental requirements and expectations increase in key markets as a result of tightening regulations, new industrial practices, and changes in consumer values and lifestyles. Although these conditions can produce additional difficulties for producers in developing countries, which are already at a disadvantage in world markets, there are also emerging trade opportunities for those able to anticipate trends and adapt to them. This is the conclusion of the *Unlocking Trade Opportunities* report, commissioned by the United Nations Department for Policy Coordination and Sustainable Development.

The industrialized economies of North America, Western Europe and East Asia will need to take the lead in making the changes in our present unsustainable consumption patterns to which governments committed in Agenda 21, the plan of action from the Rio Earth Summit in 1992. However, some developing country producers have managed to turn the drive towards sustainable consumption to their advantage. Case studies of ten which are already starting to benefit by exporting to environmentally conscious markets are presented in *Unlocking Trade Opportunities*. The producers featured range from the largest textile mill in India to small-scale fruit farmers in Chile.

These case studies were selected because they are good news stories well worth telling. None of the producers has yet reached a wholly sustainable condition. However, the success achieved so far does indicate the beginning of a serious and potentially powerful trend, and provides lessons for the future. In looking at ways forward, the report identifies several key action points, including:

I. There is a need to collect information and develop statistics: the trend towards sustainable products is new, and the actual extent of the market still needs to be assessed fully.

II. Understanding of the crucial ingredients for successful partnerships must be developed. In all the case studies presented, the development of partnerships throughout product development was central to their success.

III. Development assistance must be targeted at developing country exporters who are trying to improve their performance, especially small and medium-sized enterprises. Development assistance agencies can play an important role by providing transitional financial and technical support to strengthen environmental capacities in developing country export sectors.

IV. Independent verification of standards and codes of conduct is necessary. Development assistance could be usefully targeted at establishing group certification schemes and training local certifiers in developing countries. Developing country producers should also be much more involved in the setting of performance criteria for international standards and corporate codes of conduct.

V. Greater convergence between the social and environmental dimensions of trade could be stimulated by sharing of experience among leading businesses, environment, development and consumer organizations.

VI. Governments in the developed world could improve market access, particularly for sustainably produced goods and services from developing countries. Particular targets are the agricultural and textile sectors.

VII. Regulations in industrialized countries that hinder access to sustainably produced exports from developing countries should be removed. Governments in both developed and developing countries could also reform agricultural, energy and other subsidies to remove perverse incentives for pollution and resource depletion in order to

Seoul Statement for Transfer of Environmentally Sound Technology

Korea recently hosted the 5th General Assembly of the Asia-Pacific Parliamentarians' Conference on Environment and Development (APPCED). The 150 delegates from 16 countries and six international organizations held fruitful discussions on the main theme, "Implementing the Concept of Sustainable Development in the Asia-Pacific Region and Environmentally Sound Technology Transfer". The views of the participants are reflected in the Seoul Statement on Environmentally Sound Technology Transfer, reproduced below.

We, parliamentarians representing the Asia-Pacific region at the 5th General Assembly of the Asia-Pacific Parliamentarians' Conference on Environment and Development, the APPCED, Reaffirm our conviction that sustainable development is achievable as manifested at the Rio Summit, and adopt the following Seoul Statement:

Convinced that the realization of our vision for the 21st century for sustainable development is the foundation for the common spirit of regional community as well as for mutual prosperity; and

Stressing once again the urgent need for parliamentarians and governments, particularly of the more developed countries, to increase, not to decrease, official development aid and provide new and additional funds to developing countries, in order to facilitate the transfer of environmentally sound technologies in the belief that this is one of the most important means by which sustainable development can be attained;

We resolve to:

1. Exert efforts to devise new and additional strategies to facilitate the transfer of environmentally sound technologies, recognizing the serious concern for accelerated environmental degradation and the growing perception of environmental technologies as being public goods, though the transfer of such environmentally sound technologies is primarily a business-business transaction among the private sectors;
2. Call for the interest and cooperation of parliaments, governments and other relevant bodies in the region, with the clear recognition that publicly owned technologies can play an important role in catalyzing the transfer of environmentally sound technologies within and among countries;
3. Urge the parliaments of the region to establish, improve, and reinforce their national legislative frameworks to facilitate the transfer of environmentally sound technologies and know-hows which are publicly owned and publicly funded;
4. Recommend the governments in the region review the institutionalization of appropriate mechanisms, such as the establishment of a Technology Bank, which will act as an incentive to promote the contribution of public sectors to the transfer of environmentally sound technologies;
5. Call for the contribution of the private sector and/or enterprises in the transfer of environmentally sound technologies; recognizing their significant impact on the environment in the region. And, urge the governments to provide fiscal and/or other incentives for the private sector and/or enterprises so that they can work toward this end.
6. Acknowledging the need to protect intellectual property rights as an essential factor to encourage the transfer of technology, urge the international community to provide an institutional mechanism which will ensure that the protection of intellectual property rights is not abused or used as a pretext to hinder the transfer and dissemination of environmentally sound technologies, thereby undermining the value thereof;
7. Call on the governments of the region to make common efforts to bring about improvements in environmental standards, and implement environmental regulations and strengthen their enforcement, thus encouraging the adoption and development of environmentally sound technologies. And further urge these governments to renew their commitment to major international environmental conventions;
8. Encourage stepped-up efforts to support the development of joint programs in the areas of science and technology, as well as education and training, as part of capacity-building for the transfer of technology to developing countries;
9. Urge parliaments and governments of developed countries to exert efforts to transfer environmentally sound technology in preferential and non-commercial terms to developing countries;
10. Reaffirm that Technology Needs Assessment (TNA) facilitates technology transfer and acts as an effective tool to enhance technological capacity and competitiveness by properly identifying the economic and social needs of a particular country, including the need to achieve population stability, thus contributing to the establishment of a mutually beneficial relationship between the providers and recipients of the technology;
11. Anticipate that the benefits of current public-private cooperation schemes in some developed counties can be extended to regional levels;
12. Urge the governments in the region to devise measures to secure sources of financial assistance for environmental industries for which a market is yet to be developed and call on international financial bodies to play a crucial role in such ways as bankrolling environmental technology ventures, keeping in mind that the market for environmental industries in the Asia-Pacific region is promising;
13. Urge the governments as well as relevant organizations of the region to step up efforts to provide proper measures for the standardization of environmental specifications, such as the emerging and important LCA (Life Cycle Assessment) techniques, in order to further develop the environmental industry in the region and enhance mutual compatibility;
14. Call on the respective countries to exert efforts to identify and eliminate existing barriers, including barriers of a purely political nature,

CHINA

IRAQ

KAZAKSTAN

NEW ZEALAND

REPUBLIC OF KOREA

SOLOMON ISLANDS

U.S.A.

VIETNAM

CHAIRMAN
DRAFTING COMMITTEE

that prevent many developing countries from having access to a number of systems and/or mechanisms such as clearinghouses for environmental information presently available, stressing the need for assistance to those countries still behind in information technologies and infrastructures; and

15. Encourage governments of this region to engage in joint efforts to identify and establish agreed upon and measurable indicators for various levels of technology transfer.

We hereby witnessed and signed on June 7, 1997 in Seoul, Republic of Korea.

INDIA

JAPAN

NAURU

NORFOLK ISLAND

SINGAPORE

THAILAND

VANUATU

WESTERN SAMOA

For more information, contact: APPCED Secretariat, Rm. 833 National Assembly Members' Bldg. 1. yoido-dong, youngdeungpo-ku, Seoul, Korea.

create a more level playing field for sustainable consumption and production.

The case studies and recommendations for ways forward presented in *Unlocking Trade Opportunities* indicate pathways down which the world trade system could move to increase trade opportunities for sustainable consumption and production. The challenge is now to broaden the number of developing country enterprises that can turn this raw potential into practical financial, social and environmental benefits.

For more information, contact: UN Department of Policy Co-ordination and Sustainable Development, Division for Sustainable Development, nited Nations, Two UN Plaza, New York, NY 10017, USA. Fax: +1 (212) 1963 4260. Internet: www.un.org/dpcsd. ◆

Unleaded fuel in Fiji: good for the environment and good for consumers

The government of Fiji has introduced legislation requiring that all gasoline sold in the country be lead-free by 1999. In line with this decision, the Shell company has decided to make unleaded fuel available from July 1997.

The move will of course be beneficial for the environment and public health, in that the amount of airborne lead will be reduced. Interestingly, however, it will also be beneficial to consumers in other ways. Because unleaded fuel was not available in Fiji, motor traders were restricted as to the types of cars they could import as leaded engine models are being produced in ever decreasing numbers. The Fiji Motor Traders Association (FMTA) is confident that the prices of certain types of vehicles will fall, and that consumers will now have a far wider choice of models and equipment options. Unleaded fuel in Fiji also has a lower at-the-pump price than leaded; this will be a major advantage for businesses operating fleets of vehicles.

For more information, contact: Fiji Motor Traders Association, P.O. Box, Suva, Fiji. ◆

A purchaser's guide from Norway's GRIP Centre

The Norwegian centre for sustainable production and consumption, the GRIP Centre, has produced a guide to help environmentally aware members of companies who are themselves purchasers or who take an active part in the process. The guide is a practical tool offering help in specifying product requirements. It addresses supplier requirements, the evaluation of offers, follow-up on deliveries, etc. as ways to ensure that environmental considerations are given attention at each stage. Practical tools include ready-made questionnaires relating to products and to potential suppliers' environmental management structures.

The GRIP Centre was founded by the Norwegian Ministry of the Environment with the stated objective of contributing to achieving the objectives of sustainable production and consumption, as defined in Chapter 4 of Agenda 21. By combining environmental and market insight and organizational measures, the Foundation intends to contribute to sustainable development in both private and public enterprises in Norway.

Other GRIP guides have been published on offices; building construction; building management, operation, maintenance and development; hotels; and cycle tourism.

For more information, contact: GRIP Senter, Stromsveien 96, P.O.B. 8100 Dep, 0032 Oslo, Norway. Tel: +47 (22) 57 36 00, Fax: +47 (22) 68 87 53. ◆

Industry Updates

Rhône-Poulenc and Philips Electronics: the first transnational corporations to sign the CCMS and EPE protocol for sustainable development

The China Centre for Environmental Management Systems (CCMS) and European Partners for the Environment (EPE), with the support of UNEP, have invited European and EPE transnational company members with plants in China to sign a protocol for sustainable development. Rhône-Poulenc (France) and Philips Electronics (Netherlands) were the first companies to sign, but others have declared their intention to do so in the near future. The text of the protocol is given below.

Protocol to celebrate the fifth anniversary of the Rio Conference

The challenge of sustainable development calls for new and effective partnerships. In the search for equilibrium between environmental protection and preservation, social stability and economic growth which the pursuit of sustainable development engenders, transnational companies have a crucial role to play.

With their unique management skills and advanced technological assets transnational corporations can make a substantial contribution to sustainable development.

There are environmental benefits as well as a commercial logic behind transnational companies aiming for better levels of environmental performance. Such companies operating in China have an opportunity to broaden environmental awareness by giving a lead, in cooperation with supporting local companies, for the global benefit.

In the area of global corporate environmental management, Agenda 21 invites transnational corporations to:

1. recognize environmental management as among the highest corporate priorities and as a key determinant to sustainable development (ch. 30);
2. establish environmental management systems, including environmental auditing of production and distribution sites (ch. 20.13 (i));
3. strengthen partnerships to implement the principles and criteria for sustainable development (ch. 30.7);
4. have a special role and interest in promoting cooperation in technology transfer, and in building a trained human resource pool and infrastructure in host countries (ch. 34.27);
5. share their environmental management experiences with the local authorities, national governments and international organizations (ch. 30.22).

The signatories, EPE Corporate Members and European Companies having or intending to set up plants in China,

- wish to mark the Fifth Anniversary of the UN Conference on Environment and Development;
- undertake to operate their manufacturing facilities in China according to an Environmental Management Scheme (ideally, certified ISO/EMAS)
- meet China's requirements regarding companies to secure Chinese environmental legislation by the year 2000;
- implement the environmental management principles of

(i) continuous improvement

(ii) access to information through a Public Statement

- encourage local companies to move to meet China's stated environmental and sustainability objectives;
- share good experience in the implementation of Environmental Management Systems and work actively to keep China updated on the latest EMS developments within Europe and around the world, via training programmes and exchange of experience;
- promote environmental awareness among employees and local communities, increasing the knowledge of significant environmental effects and how to prioritize dealing with them;
- agree to meet in the year 2000 with the Chinese institutions and European Partners for the Environment to review the implementation of the present protocol and update it if necessary.

For more information, contact: European Partners for the Environment, Avenue Mounier 83, Box 1, B1200 Woluwe, Belgium. Tel: +32 (02) 771 15 34, Fax: +32 (02) 770 53 86. ◆

Encosteel – world conference on steel and sustainable development

Around 200 experts from within the steel industry and other sectors met in Stockholm on 16-17 June 1997 for the Encosteel – Steel for Sustainable Development World Conference aimed at furthering environmental progress in steelmaking. The conference, organized by the International Iron and Steel Institute (IISI), the Swedish Steel Producers' Association (Jernkontoret), the United Nations Environment Programme (UNEP) and the United Nations Economic Committee for Europe (UNECE), focused on state-of-the-art methods, such as use of clean technologies and environmental management systems, which steelmakers can adopt to help them progress towards sustainability.

In a speech at the opening session Mr Maarten C. van Veen, Chairman of Koninklijke Hoogovens NV, Netherlands, told the conference that industry's view of environmental issues had evolved since initial awareness grew in the 1960s. Environment is no longer seen as an "add-on" issue to be handled by specialists. Today the steel industry's vision of steel and the environment is driven by a commitment to sustainable development, as part of a closed-loop cycle.

This message was reinforced and developed by Ms Jacqueline Aloisi de Larderel, Director of UNEP's Industry and Environment centre (UNEP IE), Paris, who urged the industry to go beyond clean technologies, to look to radical innovation to change consumption patterns, and to move from a concept of quantity (consuming more) to one of quality (consuming differently) in order to bring about the efficiency revolution.

Examples of innovative cooperation between steelmakers and customers were presented. One of the most striking is the project for the holistic design of an ultralight steel auto body (ULSAB). This is currently being undertaken by a consortium of 35 of the world's leading steel companies and carried out by Porsche Engineering Services Inc. in the United States. Holistic design, in this context, means rethinking every stage from basic vehicle architecture to each manufacturing step, in order to produce a 200 kg car body. The design must not only provide environmental benefits from reduced fuel consumption, but must also meet state-of-the-art performance and safety targets as well as offering manufacturing cost savings.

A number of other case studies were also presented. The conference included sessions on sustainability and environmental management systems, resource conservation and recycling, as well as presentations related to environmental aspects of the technologies of steel production in integrated and electric arc furnace plants.

To order the published papers of the Encosteel Conference or for more information, contact: IISI, 120 rue Colonel Bourg, B-1140 Brussels, Belgium. Tel: +32 (2) 702 89 25, Fax: +32 (2) 702 88 99. ◆

New GEMI Board of Directors and Executive Director

The Global Environmental Management Initiative (GEMI) elected new officers, Board of Director members, and a new Executive Director at its annual membership meeting held in Washington D.C. on 18 June 1997. GEMI is a non-profit organization of leading companies dedicated to

helping business achieve excellence in the areas of environment, health and safety (EH&S). The members elected to serve on the GEMI Board of Directors for 1997-1998 are:

Chair, Michele Malloy, Executive Director, Strategy, Business Development & EH&S Services, Tenneco Business Services;

Vice Chair, Bob Sherman, Manager, Corporate Environmental Compliance, Brown & Root, Inc.;

Chair, Finance, Darwin Wika, Environmental Stewardship Leader, the DuPont Company;

Chair, Idea 21 Work Group, Susan Moore, Senior Director, Environmental Affairs, Georgia-Pacific Corporation;

Chair, Tools Work Group, Vivian Pai, Director, Environmental/regulatory Affairs, Johnson & Johnson;

Chair, New Initiatives Work Group, George Nagle, Corporate Director, EH&S Systems, Bristol-Myes Squibb; and

Chair, Annual Conference, David W. Mayer, Director, Pollution Prevention & Environmental Performance, Georgia-Pacific Corporation.

The Board of Directors also named Steven B. Hellem as GEMI's new Executive Director. Mr Hellem, who has had wide experience working with companies committed to environmental, health and safety excellence, is Principal of Strat@comm, a Washington-based association management and public affairs company. He took up the GEMI Executive Director position on 1 July 1997.

For more information, contact: GEMI, 818 Connecticut Avenue, NW, Second Floor, Washington D.C. 20006, USA. Tel: +1 (202) 296 7449, Fax: +1 (202) 296 7442. ◆

International Conference on "Eco-Efficiency: A Modern Feature of Environmental Technology" in connection with ENVITEC

Düsseldorf, Germany, 2-3 March 1998

On the occasion of the 25th anniversary of ENVITEC, the world's largest trade fair for environmental technology, the Messe Düsseldorf, in cooperation with the Wuppertal Institute, is holding a conference with top international contributors from Europe, North America and Asia.

Following a welcome by conference chairman Ernst von Weizsaecker, the conference will be opened with a statement by Germany's Federal Minister of Environment, Dr Angela Merkel.

Leading corporations – notably the members of the World Business Council for Sustainable Development – are moving towards eco-efficiency for reasons of competitiveness.

Eco-efficiency is of great significance to the Asian economies where it is often considered the decisive element of competitiveness for the 21st century. Sharing this opinion is Dr Ungsuh Park, president of the economic think tank of Samsung, Korea. In his camp is Claude Fussler of the American chemical company DOW, whose book *Driving Eco-Efficiency* is currently creating a stir in managerial circles.

Dr Hans-Dieter Winkhaus, President of the German Chemical Manufactures Association and the first luncheon speaker, will talk about eco-efficiency successes in the past and aspirations for the future.

Conference Vice President, Professor Hubert P. Johann, from Mannesmann, is well known among previous ENVITEC visitors as one of the most experienced and successful practitioners of eco-efficiency on an operational level. He will talk about eco-efficiency as an objective of the eco-audit. Energy efficiency will be the topic of another segment of the conference, presented by Amory Lovins from the United States.

Maurice Strong, Secretary General of the 1992 Earth Summit in Rio de Janeiro, and top advisor to the World Bank, will be the dinner speaker. Other important speakers at the conference include Per Grunewald, Vice President, Electrolux; Wilfried Kaiser, Board of ABB Germany; Florentin Krause, Lawrence Berkeley Lab; Professor David Pearce, London; Pieter Winsemius, Chairman, McKinsey, Amsterdam; and Walter Stahel, Director, Institut de la durée, Geneva.

Information and registration:
Via Internet: www.envitec.de/conference
or Wuppertal Institute for Climate, Environment and Energy,
Doeppersberg 19, D-42103
Wuppertal, Germany
Tel.: +49 (0) 202 2492 192,
Fax: +49 (0) 202 2492 108,
E-mail: eco-efficiency@wupperinst.org

UNEP Focus

UNEP Sasakawa Environment Prize awarded to Barbara Pyle, US Environmental Activist

On 3 October 1997, the United Nations Environment Programme (UNEP) announced the award of the Sasakawa Environment Prize to Ms Barbara Pyle, Vice President of Environmental Policy, Turner Broadcasting System, who is also CNN's Environmental Editor. Ms Pyle was honoured for her role in spreading the environmental message around the world. This is the first time a member of the media has received the Sasakawa award, usually reserved for environmental leaders and scientists.

In announcing the award, Lord Stanley-Clinton Davis, Acting Chairman of the Prize Selection Committee, said that "in today's electronic age and considering the crucial role the media plays in shaping public opinion, the Committee felt it important to recognize the media's contribution to the environmental cause. Ms Pyle brings environmental issues closer to the hearts and minds of people the world over. She has been a major force in the debate on sustainable development beyond the confines of international discussions to include the public at large."

Throughout her career Ms Pyle has encouraged the media to assume responsibility for and play a major role in informing and educating the public, including decision-makers. Since joining CNN in 1980 she has produced more than 35 films on environmental subjects, which have won more than 75 awards. She also founded "Earth Matters", CNN's daily environmental news feature and weekly programme on the environment. In her current series of TV specials, Ms Pyle is seeking to put a human face on the complex issues being debated at United Nations summits and conferences by profiling remarkable individuals who are succeeding in improving their own communities.

For more information, contact: United Nations Environment Programme, P.O. Box 30552, Nairobi, Kenya. Tel: +254 (2) 623491, Fax: +254 (2) 624269. ◆

Norwegian Prime Minister opens UNEP Green lane on Internet

On 2 September 1997, Mr Thorbjorn Jagland, Norway's Prime Minister, opened the United Nations Environment Programme's UNEPnet/Mercure station at Arendal, Norway.

The station, one of a series in the UNEPnet network around the world, will help improve the access to and exchange of environmental information via a "Green lane" on the Internet, serving both UNEP and its many partner organizations. The systems will be of particular benefit to those countries with inadequate telecommunications.

At the heart of this UNEP communications operation is Mercure, a satellite communications system donated to UNEP by six countries belonging to the European Space Agency (ESA): Austria, Belgium, Norway, Spain, Switzerland and the United Kingdom. The Mercure system is the technical "backbone" for connection between the UNEP stations.

One of the first uses of UNEPnet will be to assist in the dissemination of environmental information from China, in particular the presentation of a State of the Environment report on the Internet.

The six ESA member states have contributed around $US 13.5 million to the first phase of the UNEPnet/Mercure project. In addition, Norway has pledged around another $US 3.5 million for further development of UNEPnet over a five-year period.

For further information, contact: Tore J. Brevik, Director, Information and Public Affairs, UNEP, P.O. Box 30552, Nairobi, Kenya. Tel: +254 (2) 621234, Fax: +254 (2) 226886/226890. ◆

UNEP IE activity summary

Industrial Pollution Management Programme

An international on-line forum (EST Info) dedicated to the sharing of information on environmentally sound technologies (ESTs) was established by the Canadian Centre for Pollution Prevention (C2P2) for UNEP in July 1997. In this discussion forum participants are connected electronically through an E-mail list service (listserv). The forum was the result of a two and a half day meeting which took place earlier in the year in Paris, organized by UNEP's Industry and Environment centre (UNEP IE) and the International Environmental Technology Center (IETC). The 33 participants from international and government agencies, industry, universities and UNEP concentrated their efforts on how to improve the delivery of information on ESTs and how to provide feedback mechanisms that would narrow the gap between users and providers.

An Executive Summary was published to the *Steel Industry and the Environment* technical guide, produced jointly by the International Iron and Steel Institute (IISI) and UNEP. The guide, published slightly earlier in the year, addresses the need for a fundamental shift in the industry's approach to meet the goals of sustainable development through cleaner production. It also provides a framework for the transfer of environmentally sound know-how and technology. Examples from steel companies throughout the world illustrate what is technically and economically feasible with cleaner production processes.

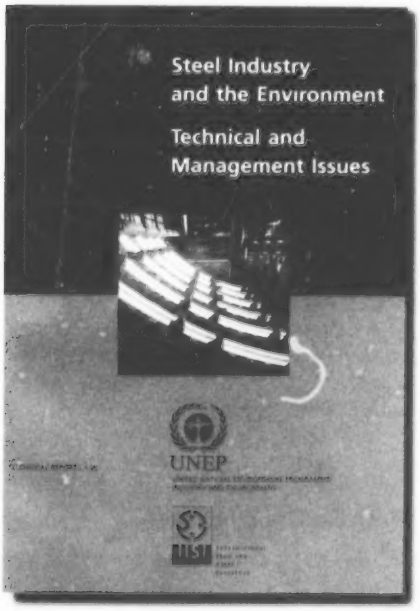
Work also continued in the area of industrial estates with the publication of a new technical report, *Environmental Management of Industrial*

Ms Ishii, Japan's Minister for Environment, visiting the UNEP IE booth at the Sustainable Development in Action Exhibition on the occasion of the United Nations General Assembly Special Session (UNGASS), 23-27 June 1997

Delegation from the National People's Congress, Environment and Resources Protection Committee, China, during their visit to UNEP IE, Paris, on 12 May 1997. A presentation on UNEP IE's programmes was given by Ms Jacqueline Aloisi de Larderel, Director, and by programme coordinators and officers.

Estates. This was followed by a workshop, organized by UNEP and the Industrial Estate Authority of Thailand (IEAT), on 1-4 September. The workshop, held on the Laem Chabang industrial estate, Thailand, brought together 28 managers and members of personnel from industrial estates and regulatory agencies in the ASEAN region. The event provided a forum for the sharing of knowledge and skills to promote effective action on pollution, waste management, industrial safety and other environmental issues.

On 21-24 October, a workshop was held in Cesme, Turkey, to discuss the technical and environmental issues surrounding cyanide residues in tailings dams at gold mines. Discussions at the workshop, which was organized jointly by UNEP and the Turkish Mining Development Foundation, covered environmental and safety issues at tailings dams; production, use and treatment of cyanide; and the use of Environmental Technology Assessment (EnTA) to evaluate the different options for gold mining.



Cleaner Production (CP)

See the Cleaner Production Newsletter on page 63 for news of Programme activities.

OzonAction

The OzonAction Programme: a presentation was made on experiences in technology transfer/environmentally sound technologies at a meeting on Clearinghouse Mechanism organized by the Convention on Biological Diversity (Montreal, 4 September 1997).

On the occasion of the celebration of the tenth anniversary of the Montreal Protocol, the OzonAction Programme participated in and/or organized a number of events organized around the 9th Meeting of the Parties to the Montreal Protocol (15-17 September, Montreal). These included a Workshop on Potential for Hydrocarbon Refrigerant Replacements, jointly organized by UNEP IE, Switzerland and Environment Canada, and a roundtable on New Industry Initiatives to Meet the 1999 Freeze through Technology Cooperation. In addition to these events, special awards were presented by Ms Dowdeswell to outstanding National Ozone Units. The OzonAction Programme also launched a voluntary pledge programme which has already been endorsed by 20 multinational corporations who have committed not to transfer new CFC-using technologies to developing/CEIT countries and to assist them in meeting the 1999 freeze.

As part of the celebration, OzonAction launched a number of new information resources for developing countries, including an awareness video and posters about the tenth anniversary of the Protocol, two sets of technical case studies ("Technologies to Protect the Ozone Layer: Case Studies on the Japanese Experience", jointly with the Japan Industrial Conference for Ozone Layer Protection, and "Solvent Case Studies from Around the World", with the US EPA), "Making Good Decisions: How to Use UNEP IE's OzonAction Clearinghouse", and a new joint Ozone Secretariat/OzonAction Programme publication list. The OzonAction Programme also distributed a case study based on the success of Ghana's national programme to phase out ODS, entitled "Surpassing the Montreal Protocol Objectives: Ghana's Success Story".

OzonAction Newsletter No. 23 was published in July, and a Special Supplement focusing on the 1999 freeze was included in the special issue of *Our Planet* distributed before and during the tenth anniversary celebrations.

The programme also co-organized and participated in the following events: Regional Workshop on Monitoring and Control of ODS Consumption for English-speaking Africa (Kampala, Uganda, 1-3 July), African Regional Workshop on ODS Phaseout in SMEs (Pretoria, South Africa, 7-10 October), International Workshop on "Viable Alternatives to ODS Solvents" (New Delhi, India, 15-20 October 1997). The following meetings of Regional Networks of ODS Officers were held: the annual meeting for Southeast Asia and the Pacific (Kuala Lumpur, Malaysia, 4-8 August 1997) and a joint meeting of the English/French Africa Networks (Gaborone, Botswana, 26-28 August 1997).

The programme also undertook missions to assist Armenia and Mongolia with various phases of their Country Programme development.

OzonAction submitted its 1998 Business Plan and the recurring part of 1998 Work Programme to the Executive Committee of the Multilateral Fund on 23 September 1997.

The programme made a presentation, at an OECD forum on climate change, on lessons that could be drawn from the implementation of the Montreal Protocol and applied to the Framework Convention on Climate Change.

Energy Programme

In preparation for the attendance by Energy Programme representatives at the third Conference of the Parties meeting (COP-3) to be held 1-10 December in Kyoto, Japan, most of the programme's work from July-October 1997 focused on climate change issues. This included the preparation of the joint UNEP/United States Environmental Protection Agency document entitled *Greenhouse Gas Emission Reduction: The Role of Voluntary Programmes*, released at Kyoto. The document identifies opportunities and barriers, and examines ways of overcoming the latter by means of voluntary programmes. Case studies are given from government and private industrial sectors in a range of countries, demonstrating that such programmes can be successful in reducing greenhouse gas emissions at relatively little cost.

On 11-12 September the Energy Programme, together with the International Energy Agency, hosted a workshop in Paris on Mutually Beneficial Incentives to Promote Activities Implemented Jointly.

Work also began on a multi-media energy auditing tool.

EnTA (Environmental Technology Assessment)

See the EnTA Newsletter on page 67 for news of Programme activities.

UNEP Industry and Environment in the regions

Activities underway in Asia and the Pacific

In mid-November, Thailand's Pollution Control Department (PCD) will conduct the first Asia Pacific Roundtable on Cleaner Production. UNEP and other groups are helping PCD organize the Roundtable, which is expected to bring together 200 participants interested in sharing ideas about how cleaner production can be promoted more widely in Asia. The Roundtable will also provide an opportunity to discuss the draft International CP Declaration, which is expected

to be ready for signature in 1998.

To capitalize on the CP Roundtable, UNEP is also organizing two additional meetings in November. The yearly Director's Meeting of the UNEP/UNIDO-sponsored National Cleaner Production Centres will be held in Bangkok so that the ten centre directors can share their experiences with CP Roundtable participants. Affiliates of the Asian Productivity Organization will also meet for two days with NCPC Directors to discuss how the CP concept can be spread through APO's network. This effort grows out of a Memorandum of Understanding signed in June by UNEP and APO, which calls for cooperation and joint efforts on cleaner production and green productivity. The hope is that the success of the NCPC in India, where the Centre is housed in the APO-affiliated National Productivity Council, can be replicated in some of the other 18 National Productivity Organizations in Asia.

UNEP IE and the Regional Office have been working hard to organize a regional training workshop in early September on Environmental Management of Industrial Estates. The objective of the workshop is to increase knowledge and experience of national managers concerning environmental planning and management of industrial estates. The workshop will follow the principles outlined in UNEP's just released Technical Report, *Environmental Management of Industrial Estates*. Partners in the effort include the Industrial Estate Authority of Thailand (which is providing the use of its estate at Laem Chabang for a realistic workshop setting), Environment Canada, and the Regional Institute for Environmental Technology in Singapore. Over 30 participants will attend the four-day workshop, half of them from neighbouring countries. UNDP offices in the Philippines, Malaysia and Vietnam have helped identify suitable participants and support their travel.

The Swedish-supported NIEM project, which aims to improve environmental management in the pulp and paper industry in Asia, had a regional meeting in Kuala Lumpur in June. NIEM Activity Leaders and industry representatives from seven countries met to discuss effective strategies for promoting preventive approaches to environmental management in this key industry. The regional meeting capped a series of eight national workshops conducted from January to June, where results of demonstration efforts to introduce cleaner production assessment methods to mills were presented to national audiences. NIEM-generated materials are increasingly used by the industry in Asia, a testimony to the economic and environmental gains that can be derived from cleaner production approaches in pulp and paper mills. The meeting in Kuala Lumpur was organized by the Malaysian NIEM core group under the direction of the Department of Chemistry.

Another Swedish-supported project had its biannual meeting in Kuala Lumpur in August. The meeting of the ODS Officers Network for South East Asia-Pacific (ODSONET-SEAP) was organized by UNEP and the Malaysian Department of Environment. ODS officers from twelve countries gathered to debate strategies and discuss programmes that foster a faster, more cost-effective phaseout of ozone-depleting substances. The Network consists of the primary government official responsible for ensuring compliance with the provisions of the Montreal Protocol in member countries: Australia, Brunei, Indonesia, Lao PDR, Malaysia, Myanmar, New Zealand, the Philippines, Singapore, Sweden, Thailand and Vietnam.

For additional information on IE activities in the Asia Pacific region, please write to:

Industry Programmes
United Nations Environment Programme
Regional Office for Asia and the Pacific
United Nations Building
Rajadamnern Avenue
Bangkok 10200, Thailand
Tel: +662 288 1679, +662 288 1133
Fax: +662 280 3829 ◆

Books & Reports

GENERAL

Measuring Eco-Efficiency in Business

There are a wide variety of users of eco-efficiency performance indicators, both within and outside companies. The needs to be met by this information accordingly vary widely, with many companies developing environmental performance measurement systems which are suited to their own environmental and eco-efficiency goals and which are not easily comparable. *Measuring Eco-Efficiency in Business* is a background document – the first publication from the Canadian National Round Table on the Environment and Economy (NRTEE) Task Force on Eco-efficiency – presenting progress to date in the development of a set of core indicators for measuring eco-efficiency in business.

(1997). Renouf Publishing Co. Ltd., 5369 Canotek Road, Unit 1, Ottawa, ON K1J 9J3, Canada. Tel: +1 (613) 745 2665, Fax: +1 (613) 745 7660. Pbk, 61p. ISBN 1-895643-64-3.

Measuring the Real World: A Textbook of Applied Statistical Methods

In a world which has become a "global village" we are increasingly inundated with information in all sorts of forms. It has become difficult to separate the relevant from the purely incidental, the truly important from the merely trivial. In order to comprehend this information, we have to be able to take a step back and to recognize true patterns of change without getting lost in incidental detail. In *Measuring the Real World: A Textbook of Applied Statistical Methods* the authors provide some tools which help in taking that step back.

This project in applied statistics focuses on some of the most important environmental issues the planet is facing at the end of the second millennium. It is designed to help readers see for themselves some of the developments which may continue to be relevant into the next century. Readers learn about some of the key developments concerning the state of the planet, while at the same time beginning to understand how the statistical methodology of data collection and data processing can be applied to describe and analyse some quantitative aspects of reality. Each chapter focuses on a specific global issue, illustrated using a number of appropriate statistical techniques, and readers are encouraged to work out their own numerical results to help develop technical competence while "discovering" the world we inhabit.

Heiner Thiessen (1997). John Wiley & Sons Ltd., Baffins Lane, Chichester, West Sussex PO19 1UD, UK. Tel: +44 (1234) 77 97 77. Pbk, 267p. ISBN 0-471-96874-9.

Eco-Efficient Concepts for the Electronics Industry Towards Sustainability – The Proceedings of the Care Innovation '96 Conference

Advances in electronics have revolutionized the way we live and do business. However, every technological advance brings with it new demands on the earth's resources and subsequent changes to the global environment. Manufacturers of electronic equipment are increasingly being made aware of their environmental impacts by legislation, customers and competitors. Recognizing their responsibility to the environment, electronics companies worldwide have been working to minimize impacts, develop new "clean" technologies, and integrate environmental considerations into new designs to address "end-of-life" issues.

The Care Innovation '96 conference, organized as part of the EU 1140 Care Vision 2000 research project, provides a snapshot of state-of-the-art developments in electronics and the environment in Europe, North America and Japan. The conference, held in Frankfurt, Germany on 18-20 November 1996, heard presentations from leading experts in the areas of: market-driven developments; technology-driven developments; end-of-life-driven developments; evaluating and communicating progress; and training for the future. The published conference papers are now available.

Technology Publishing Limited, 7 Rickett Street, West Brompton, London SW6 1RU, UK. Tel: +44 (171) 610 2222, Fax: +44 (171) 610 1003. Hbk, 371p.

The Product Side of Pollution Prevention: Evaluating the Potential for Safe Substitutes

Rapid developments in technology and industrial products frequently result in increased generation of materials which, if improperly dealt with, can become a threat to both public health and the environment.

The Product Side of Pollution Prevention: Evaluating the Potential for Safe Substitutes, from the US Environmental Protection Agency's Risk Reduction Engineering Laboratory, reports on a major EPA project in the area of the Cleaner Products Program researching methods to support the design and development of products whose manufacture, use, recycle and disposal represent reduced impacts for the environment. The report contains an in-depth study of the potential for substituting safer or less toxic chemicals for the 17 priority chemicals covered by the EPA's 33/50 voluntary pollution reduction programme.

(1995). Government Institutes Inc., 4 Research Place, Suite 2000, Rockville, Maryland 20850, USA. Tel: +1 (301) 921 2355, Fax: +1 (301) 921 0373. Pbk, 208p. ISBN 0-86587-479-4.

Approaches to an Earth Audit

There is an urgent need for novel ways to report to the world the status of progress towards sustainable development. The *Approaches to an Earth Audit* report, prepared by the UNEP Environment Assessment Programme and the Earth Council, explains why this is so and investigates various theoretical perspectives useful for the preparation of an Earth Audit.

(1997). Division of Environmental Information and Assessment, United Nations Environment Programme, P.O. Box 390552, Nairobi, Kenya. Tel: +254 (2) 621234, Fax: +254 (2) 226886/226890. Pbk, 97p. ISBN 92-807-1666-2.

Industry and the Environment: Practical Applications of Environmental Management Approaches in Business

One of the results of growing official recognition of the urgent need to address environmental issues is the increasing number of environmental laws that have been passed to attempt to regulate environmental impacts. However, the costs imposed by such regulations are high and, as countless examples show, legislation is not a panacea for all environmental problems. Both market-based and self-regulatory schemes are therefore increasingly being used as alternative solutions.

The latter were the main focus of the 3rd Conference of the Nordic Business Environmental Management Network on 28-30 March 1996 at the Scandinavian Congress Centre, Aarhus, Denmark. The conference proceedings, published as *Industry and the Environment: Practical Applications of Environmental Management Approaches in Business*, provide a source of up-to-date information on current environmental management issues. The texts of the papers presented will be a useful basis or supplement for courses on environmental management and a handy reference for executives, managers and engineers with environmental responsibilities.

John P. Ulhoi and Henning Madsen, eds. (1996). The Corporate Technology and Environmental Research Group, Attn. Dr John P. Ulhoi, Haslegaardsvej 10, DK 8210 Aarhus V., Denmark. Tel: +45 8948 6459, Fax: +45 8615 7629. Pbk, 467p. ISBN 87-983186-1-6.

Sustainable Development: OECD Policy Approaches for the 21st Century

This volume provides an overview and analysis of trends in policies already established and of new policy directions related to many of the key socio-economic and sectoral issues of Agenda 21. It demonstrates how sustainability has emerged as an overarching policy goal for the OECD and its 29 member countries since the Rio Earth Summit of 1992, and how progress hinges on the integration of environmental and social goals with economic ones.

Part I of this two-part volume focuses on the socio-economic dimensions of Agenda 21 and means of implementation. Subjects include: the integration of economics and environment; trade and environment; changing consumption and production patterns; assessing environmental performance; development cooperation; and the evolution of aid agencies since Rio. Part II takes an in-depth look at nine sectoral issues: energy; transport; agriculture; toxic chemicals; climate change; nuclear energy; urbanization; biotechnology; and education.

(1997). OECD Publications, 2 rue André Pascal, 75775 Paris Cedex 16, France. Tel: +33 (1) 45 24 82 00, Fax: +33 (1) 49 10 42 76. Pbk, 181p. ISBN 92-64-15487-6.

Environmental Audits – 7th Edition

In the six years since the publication of the sixth edition of *Environmental Audits*, much has happened – including the very recent development of ISO 14000 guidelines – to make the volume out of date. The 7th Edition is completely updated to reflect significant recent developments in the field of environmental auditing and to cover the development of computer software, automated checklists, regulatory data bases, and new approaches to report writing.

Lawrence B. Cahill (1996). Government Institutes, Inc., 4 Research Place, Suite 200, Rockville, Maryland 20850, USA. Tel: +1 (301) 921 2355, Fax: +1 (301) 921 0373. Pbk, 727p. ISBN 0-86587-525-1.

Big Cities, Small Means, European Funding for Environment and Urban Development: An Orientation Guide for Southern NGOs

Urbanization brings undoubted benefits, but it also creates environmental and social dilemmas. Cities in the North, and to an even greater extent those in the South, suffer from increasing environmental degradation, unsanitary conditions, lack of health and public transport services, air and water pollution, etc.

A growing number of NGOs in the South are involved in urban management projects. They play an important role in identifying environmental problems in urban areas and in offering potential solutions. Recognition of the importance of NGOs in development processes has created a wider scope of financial and non-financial resources. The question of accessibility of financial resources remains, however, a thorny issue. *Big Cities, Small Means*, a new publication from Both Ends, addresses this issue by assisting NGOs directly in their search for finances and guides the reader through the labyrinth of policies, eligibility criteria, and application procedures of both private donors and government funding agencies throughout Europe.

(1997). Both Ends, Damrak 28-30, 1012 LJ Amsterdam, The Netherlands. Tel: +31 (20) 6230823, Fax: +31 (20) 6208049. Pbk, 159p. ISBN 90-801592-7-1.

Principles in Practice

The World Commission on Environment and Development (Brundtland Commission) called for the development of new ways to measure and assess progress towards sustainable development. This call was echoed in Agenda 21 from the 1992 Earth Summit. In response to these calls, a group of international measurement practitioners and researchers came together at the Study and Conference Center in Bellagio, Italy, to review progress to date and to synthesize insights from practical ongoing efforts. The Bellagio Principles for Assessment are intended to serve as guidelines for the whole assessment process, including the choice and design of indicators, their interpretation, and communication of results.

Principles in Practice, published by the International Institute for Sustainable Development (IISD), spells out the eight Bellagio principles, describes the background to their development, and illustrates their use with ten case studies, each of which shows the application of one of the principles.

IISD is an independent not-for-profit corporation headquartered in Manitoba, Canada. Its mission is to promote sustainable development in decision-making within Canada and internationally.

Peter Hardi and Terence Zdan, eds. (1997). International Institute for Sustainable Development, 161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba R3B 0Y4, Canada. Tel: +1 (204) 958 7700, Fax: +1 (204) 958 7710. Pbk, 166p. ISBN 1-895536-07-3.

The Environment Industry – The Washington Meeting

This publication is a compilation of the proceedings of a workshop on the global environment industry which aimed to improve analysis of the sector, provide comparable data on employment and growth potential, and break new ground in regard to a common definition and classification. The meeting was convened by the OECD, in collaboration with the US Department of Commerce and the US Environmental Protection Agency.

(1996). OECD Publications, 2 rue André Pascal, 75775 Paris Cedex 16, France. Tel: +33 (1) 45 24 82 00, Fax: +33 (1) 49 10 42 76. Pbk, 285p. ISBN 92-64-14768-3.

Interim Definition and Classification of the Environment Industry

As a follow-up to the Washington meeting on the global environment industry, an OECD/Eurostat Informal Working Group was created with the aim of improving analysis and understanding of the features of the industry and of developing a common framework for its definition and classification. The principal outcome of the work of this group is the *Interim Definition and Classification of the Environment Industry* synthesis report. The work so far is to be considered as a first general common definition and classification of the environment industry. It is being circulated to a wider audience for comments in order to produce an improved final version.

(1996). OECD Publications, 2 rue André Pascal, 75775 Paris Cedex 16, France. Tel: +33 (1) 45 24 82 00, Fax: +33 (1) 49 10 42 76. Pbk, 27p.

The Environment Industry and Markets in Selected Central and Eastern European Countries

This document presents an analysis of the development of the environment industry in Bulgaria, the Czech Republic, Poland, the Slovak Republic and Slovenia.

Chapter 1, which presents the Synthesis Report of an Advisory Group on Industry and Environment (AGIE) 1994 meeting, contains recommendations on government policy to support the development of the environment industry. These include identifying new financing mechanisms, such as environmental funds; pursuing technology cooperation; and encouraging the environment industry to develop and promote cleaner technologies. Subsequent chapters present case studies focusing on the structure and size of the environment industry in individual countries, its employment potential, and the impact of regulatory and industrial policy on its development.

(1996). OECD Publications, 2 rue André Pascal, 75775 Paris Cedex 16, France. Tel: +33 (1) 45 24 82 00, Fax: +33 (1) 49 10 42 76. Pbk, 88p.

R'97 Congress Proceedings

Together with the United Nations Environment Programme (UNEP), a committee of about 100 personalities from academia, industry and European and national environmental protection agencies invited specialists in the field of integrated resources management (IRM) to the R'97 Congress held in February 1997 in Geneva. Participants from all over the world gathered to debate the solutions for sustainable development in resource management from the social, legislative and political points of view. The five volumes of the *R'97 Congress Proceedings* are now available.

(1997). R'97 Project Manager, c/o Peak Ltd.,

Seefeldstrasse 224, 8008 Zurich, Switzerland. Tel: +41 (1) 385 29 29, Fax: +41 (1) 385 29 95. Pbk, 5 volumes. ISBN (complete edition) 3-905555-06-9.

Environmental Awareness Training – A Strategy for Change

It is relatively easy to discuss and set theoretical environmental objectives and goals, and even to find specialists in most of the related fields such as waste management, health and safety, etc. However, bringing about meaningful cultural change within an organization is far more difficult, and can be very time-consuming. *Environmental Awareness Training – A Strategy for Change* aims to provide companies and trainers with effective practical help in developing an environmental training programme for employees. The book is based on the realization that many companies are aware that better environmental performance depends on contributions from the entire workforce but are not sure how to bring this about.

In the first part the issues, necessary company responses, and methods that can be used to develop an environmental training programme are examined. The important question of why there is need for action in this area is also addressed. The aim of this part is to motivate people, both managers and employees, and to reinforce the notion that action on their part is necessary. The second part of the book examines what companies can actually do, such as energy and waste audits and organizational structures, and gives examples of these, illustrated by case studies.

The final part gives a rapid overview of how to set up an environmental awareness training programme. However, it stops short of giving the fine details of a model agenda or how to organize sessions. Such detailed information is given on a diskette which accompanies the book. Presenting the information in this way makes it easy for trainers to customize their own applications and model programme formats.

Anne V. Vale (1996). MacMillan Education Australia Pty. Ltd., 107 Moray Street, South Melbourne 3205, Australia. Hbk, 224p. ISBN 0-7329-4118-0.

By-product Synergy: A Strategy for Sustainable Development – A Primer

In March 1995 the US Environmental Protection Agency (EPA) announced that it would work with industry to develop incentives for "green twinning", which, in practice, means using waste products from one industry as inputs to another industry. Later in that year the Business Council for Sustainable Development – Gulf of Mexico (BCSD-GM) received a grant from the EPA to identify case studies of "green twinning" or, as the BCSD-GM calls it, by-product synergy.

During the course of the project, the BCSD-GM realized that the best way to maximize the value of its work would be to produce a primer for business, community and government leaders in positions to promote and practise by-product synergy. The primer is intended to educate, communicate and illustrate, but above all the BCSD-GM intends it to inspire, by showing how business, society and the environment can all benefit from by-product synergy as a strategy for sustainable development.

(1997). Business Council for Sustainable Development-Gulf of Mexico, 8303 North MOPAC Expressway, Suite 210 A, Room 240, Austin, TX 78759, USA. Tel: +1 (512) 794 8813, Fax: +1 (512) 794 8815. Pbk, 26p.

Agenda 21 – The First Five Years

This report was prepared for the 1997 United Nations General Assembly Special Session (UNGASS) to review Agenda 21 and related outcomes of the 1992 United Nations Conference on Environment and Development (UNCED). It is a statement of progress made by the European Community in implementing Agenda 21 and is intended to complement the national reports presented by individual member states.

(1997). European Commission, Directorate General DG XI Environment, Nuclear Safety and Civil Protection, Rue de la Loi 200, B-1049 Brussels, Belgium. Tel +32 (2) 299 49 49, Fax: +32 (2) 299 11 05. Pbk, 178p. ISBN 92-828-0361-9.

Report of the OECD Workshop – "Rethinking Paper Consumption"

Global paper consumption has increased by a factor of 20 in this century, and by a factor of three just during the last decade. Average annual per capita consumption varies widely, from 333 kg/person in the US to just 12 kg/person in the developing world. There are many concerns about the sustainability of continued growth in paper consumption affecting every stage of production and consumption. The most critical environmental impacts are not within the control of the final consumer, but occur higher up the production and use chain. This realization has resulted in an evolution in government policy away from a focus on paper recycling to a more comprehensive approach based on life-cycle management, and including product standards and extended producer responsibility.

In November 1996, the Norwegian Ministry of Environment hosted an OECD Experts Workshop to examine the various aspects of current paper consumption trends and the role of different actors in reducing environmental impacts at different points in the production-consumption chain.

(1997). OECD Publications, 2 rue André Pascal, 75775 Paris Cedex 16, France. Tel: +33 (1) 45 24 82 00, Fax: +33 (1) 49 10 42 76. Pbk, 134p.

The Global 500 Roll of Honour for Environmental Achievement

The United Nations Environment Programme (UNEP) launched the Global 500 Roll of Honour for Environmental Achievement in 1987. Since then the award has been given to 607 individuals and organizations for outstanding achievements in the protection and improvement of the environment.

This Tenth Anniversary edition, coinciding with UNEP's 25 Anniversary year, gives the profiles of 18 award winners whose work can be an inspiration to those who, in the words of Elizabeth Dowdeswell, UNEP's Executive Director, "wish to join the global coalition dedicated to protecting the environment, thus promoting the concept of sustainable development."

(1997). United Nations Environment Programme, P.O. Box 30552, Nairobi, Kenya. Tel: +254 (2) 623491, Fax: +254 (2) 623692. Pbk, 35p. ISBN 92-807-1383-3.

CMER Workshop – Surveying Company's Commitment to Environmental Sustainability

The Center for the Management of Environmental Resources (CMER) held its fourth annual workshop on 23 May 1997. It was called "Surveying Company's Commitment to Environmental Sustainability (SUCCESS)". The SUCCESS workshop was the first step in a joint research project between the technology management department at the European Institute of Business Administration (INSEAD) and the CMER to develop an environmental quality management model. Copies of the presentations given at the workshop are now available.

(1997). INSEAD, Boulevard de Constance, 77305 Fontainebleau Cedex, France. Tel: +33 (1) 60 72 40 00, Fax: +33 (1) 60 74 55 00/01. Pbk, 120p.

UNDP Human Development Report 1997

"Human poverty is more than income poverty – it is the denial of choices for opportunities for living a tolerable life." This is the challenging opening statement of the *Human Development Report 1997* from the United Nations Development Programme (UNDP). The report reviews the challenge to eradicate poverty from a human development perspective and focuses on poverty not just in terms of lack of income, but as a hindrance to the growth and development of every aspect of life. The agenda which is proposed therefore includes but goes beyond income, to encompass action in the critical areas of gender equality, pro-poor growth, globalization, and the governance of development.

The report concludes that the world has the

resources and know-how to create a poverty-free world in less than one generation, and that eradicating poverty, as well as being a moral imperative, is a practical possibility.

UNDP (1997). Oxford University Press, Inc., 198 Madison Avenue, New York, New York, 10016, USA. Pbk, 245p. ISBN 0-19-511997-5.

The World Health Report 1997

The World Health Report 1997 focuses on major chronic non-communicable diseases, such as cancer and heart disease, diabetes and rheumatic conditions, and mental and neurological disorders. It shows that the bonuses of an increasing life span are in danger of being outweighed by the burden of chronic diseases. Meanwhile, the threat of infectious diseases continues, so that the battle for health must be fought on both these fronts.

The report examines and explains the causes of these diseases, and highlights the main risk factors in their development, from genetic influences to the unhealthy lifestyles that are becoming increasingly commonplace in a rapidly changing world. Subtitled *Conquering Suffering, Enriching Humanity*, this publication identifies priorities for international action in regard to prevention, treatment, cure and rehabilitation. It also offers individuals the best available advice on protecting their own health.

(1997). Office of World Health Reporting, World Health Organization, 1211 Geneva 27, Switzerland. Tel: +41 (22) 791 21 11, Fax: +41 (22) 791 4870. Pbk, 162p. ISBN 92-4-156185-8.

The World Trade Organization and Sustainable Development: An Independent Assessment

This report from the International Institute for Sustainable Development (IISD) looks at the relationship between the World Trade Organization (WTO), created in 1994 by the Uruguay Round of trade talks, and the concept of sustainable development. It reviews the progress of the WTO in linking trade and sustainable development, as well as examining possible ways forward.

(1996). International Institute for Sustainable Development, 161 Portage Avenue East, Winnipeg, Manitoba, Canada R3B 0Y4. Tel: +1 (204) 958 7700, Fax: +1 (204) 958 7710. Pbk, 65p. ISBN 1-895536-03-0.

Subsidizing Unsustainable Development – Undermining the Earth with Public Funds

The authors of this study have calculated that something like $US 700 billion is being spent each year on subsidies in just four economic sectors: water, agriculture, energy, and road transport. Much of this money is wasted because these subsidies do not continue to serve their original purpose. In many cases they are exacting a high cost in environmental and social terms, thus undermining prospects for sustainable development.

Subsidizing Unsustainable Development – Undermining the Earth with Public Funds acknowledges that subsidies can be beneficial as a means of providing incentives to meet economically or sociably desirable objectives. However, it shows that subsidies which have long since served their original purposes provide disincentives to sustainable development while denying the poor the benefits which better deployment of resources could bring.

André de Moor and Peter Calmai (1997). Institute for Research on Public Expenditure, Oranjestraat 8, 2514JB, The Hague, Netherlands. Tel: +31 (70) 370 91 00, Fax: +31 (70) 356 29 33. Pbk, 66p. ISBN 0-9681844-0-5.

Environmental Management – A General View

The Dutch government has adopted policies to encourage companies to implement environmental management systems as a way of reducing their environmental impacts. Company environmental management systems are an important element of Dutch environmental policies, which stress the need for the business community to face up to its environmental responsibilities. *Environmental Management – A General View*, from the Dutch Ministry of Housing, Spatial Planning and the Environment, presents these policies, gives in-depth descriptions of some of the instruments used by government, and reviews progress to date.

(1997). Ministry of Housing, Spatial Planning and the Environment, Directory of Information and External Relations, P.O. Box 20951, 2500 EZ The Hague, The Netherlands. Pbk, 116p.

EnVoc – Multilingual Thesaurus of Environmental Terms

Environmental information deals with complex scientific, technological and social problems which impact the environment. These include climate change, global warming, stratospheric ozone depletion, degradation of freshwater resources, deforestation, loss of biological diversity, disposal of hazardous wastes, noise, and environmental diseases. The *EnVoc – Multilingual Thesaurus of Environmental Terms* (formerly known as the Infoterra Thesaurus of Environmental Terms) is a reference tool which will be of use to librarians, documentalists, developers of databases or thesauruses, terminologists, GIS specialists, translators, interpreters, environmental information specialists, and others requiring a precise multidisciplinary terminology.

(1997). United Nations Environment Programme, P.O. Box 30552, Nairobi, Kenya. Tel: +254 (2) 623491, Fax: +254 (2) 624269. Pbk, 248p. ISBN 92-807-12608.

The Ends Report – special CD-ROM edition for ENDs subscribers

The May 1997 *ENDS Report* was issued with a CD-ROM, free to all subscribers, featuring *The ENDS Report*, the *ENDS Environmental Consultants Directory*, *ENDS Environment Daily* and extracts from the ENDS Web Site.

(1997). Environmental Date Services, Finsbury Business Centre, 40 Bowling Green Lane, London EC1R 0NE, UK. Tel: +44 (0171) 278 4745, Fax: +44 (0171) 415 0106.

ENERGY

The Impact of Liberalization of the European Electricity Market on Cogeneration, Energy Efficiency and the Environment

This report, commissioned by Cogen Europe, describes the proposed rules for an internal market in electricity and gas and the possible effects of liberalization on the development of cogeneration, energy efficiency, and the environment. The process of liberalization gained new impetus in Europe in 1996, when the European Union Member States agreed on the terms of an electricity Directive opening the electricity market to competition and started similar negotiations related to gas.

In this context, Cogen Europe commissioned a study (funded jointly by Cogen Europe, the Environment Directorate of the European Commission, the Danish Energy Agency, Elkraft Power Company, the Environmental and Energy Management Directorate of the UK Department of the Environment, PowerGen CHP, and European Gas Turbines) to help clarify the overall consequences of liberalization. In twelve sections the study aims to assess the potential impact of Europe-wide energy market liberalization, as characterized by the growth of cogeneration. Possible resulting changes in levels of environmentally harmful emissions, especially carbon dioxide, are also assessed.

(1997). The European Association for the Promotion of Cogeneration, rue Gulledelle 98, 1200 Brussels, Belgium. Tel: +32 (2) 772 82 90, Fax: +32 (2) 772 50 44. Pbk, 355p.

Renewable Energy Technologies in Africa

It is well recognized that the energy sector plays a key role in any programme for economic development. Equally, supply of energy at the household level is an essential part of everyday life. Renewable energy technologies (RET) can offer solutions in both these areas. *Renewable Energy Technologies in Africa*, published in association with the African Energy Policy Research Network (AFREPEN) and the Stockholm Environment Institute (SEI), presents the work of African scholars, policy-makers and project managers involved in renewable energy technology research. The book sums up what is known about the innovation and deployment of RET across the whole of Eastern Africa (including the Horn) and in Southern Africa (including South

Africa), and reviews the prospects for such technologies by examining their current status and the barriers that limit their wide-scale use.

AFREPEN was created in 1989 to promote research concerning the formulation and implementation of appropriate energy policies in the countries of East, Central and Southern Africa.

(1997). Zed Books Ltd., 7 Cynthia Street, London N1 9FJ, UK. Pbk, 269p. ISBN 1-85649-090-4.

Efficiency and Sufficiency – Towards Sustainable Energy for Transport

Many successful environmental policies applied in Europe have led, for instance, to improved water quality, reduced acidification, and gradual phasing out of ozone-depleting substances. However, the authors of *Efficiency and Sufficiency – Towards Sustainable Energy for Transport*, prepared for UNEP, argue that a key factor in these successes was that technological solutions were available at relatively low costs and that these modest costs made the political choices to implement solutions relatively easy.

In more recent years, public and political attention has shifted towards more persistent environmental problems where technological solutions alone may not be sufficient to bring about the change needed in order to set out on the path to sustainable development. The question arises as to whether we must also begin to reduce and limit the growth of environmentally damaging activities. This is often known as the "efficiency versus sufficiency" dilemma. Efficiency means greater technological progress, sufficiency means reducing activities.

Efficiency and Sufficiency – Towards Sustainable Energy for Transport looks at the "efficiency vs. sufficiency" dilemma in relation to some of the key issues relevant to transport and sustainable development. It analyses the main feedback loops hindering a reduction in carbon dioxide (CO_2) emissions and looks at possible policy responses.

(1997). Centre for Energy Conservation and Environmental Technology, Oude Delft 180, 2611 HH Delft, The Netherlands. Tel: +31 (15) 2 150 150, Fax: +31 (15) 2 150 151. Pbk, 43p.

Examples in Action – Sustainable Energy Experiences in Developing and Transition Countries

The important growth in energy demand in many developing and transition countries over the last decade has led to some of these countries becoming significant greenhouse gas (GHG) emitters. If present energy consumption and emission patterns hold, as projections suggest they will, the developing world could account for more than 50 per cent of global GHG emissions within two decades.

Faced with this situation, some developing countries have already embarked on projects to promote energy efficiency and the use of renewable sources. It is significant that many of these projects have been initiated not to meet obligations to cut emissions, since many of the countries are not signatories to international agreements, but on their economic merits. *Examples in Action* describes 16 projects in developing and transition countries from which lessons can be learned. There are chapters on energy policy, transportation, end-use efficiency, and renewable energy.

(1996). International Institute for Energy Conservation, 750 First Street, N.E., Suite 940, Washington, D.C. 20002, USA. Tel: +1 (202) 842 388, Fax: +1 (202) 842 1565. Pbk, 120p.

Cogeneration: Policies, Potential and Technologies

Cogeneration's potential as a means of efficient energy use has received considerable attention in India in recent years. In view of the growing importance of cogeneration in that country, the Tata Energy Research Institute (TERI) organized the first International Cogeneration Conference in New Delhi on 10-12 March 1996.

Cogeneration: Policies, Potential and Technologies is a compilation of the papers presented to the conference, which was attended by over 255 participants from India, Europe, North America and South-East Asia. The book is divided into sections covering technical potential of cogeneration; regulatory and financial aspects; and cogeneration technologies using both fossil fuels and renewable sources. The case studies presented (from India and elsewhere) demonstrate that there is now a substantial body of experience in cogeneration which can and should be shared, and that there are several as yet unexplored avenues with unexploited potential.

(1997). Tata Energy Research Institute, Darbari Seth Block, Habitat Place, Lodhi Road, New Delhi – 110 003, India. Tel: +91 (11) 462 2246, Fax: +91 (11) 462 1170. Pbk, 296p. ISBN 81-85419-28-0.

The Oil Industry – Operating in Sensitive Environments

Developed by the International Petroleum Industry Environmental Conservation Association (IPIECA) in partnership with the Oil Industry International Exploration and Production Forum (E&P Forum), this publication has three objectives: to demonstrate that minimal impact operations are achievable in a diverse range of environmental and social settings; to actively encourage good practices, high standards and continuous improvement; and to provide a basis for discussion with groups outside the industry, with a view to promoting ongoing improvement of environmental performance. Case studies provide examples of responsible operation by the industry in sensitive environments.

(1997). International Petroleum Industry Environmental Conservation Association, 2nd Floor, Monmouth House, 87-93 Westbourne Grove, London W2 4UL, UK. Tel: +44 (0171) 221 2026, Fax: +44 (0171) 229 4948. 23 loose-leaf case studies.

TRANSPORT

The Death of Motoring: Car Making and Automobility in the 21st Century

The automotive industry is facing an unprecedented environmental and economic crisis that calls into question the very essence of the industry. The crisis, according to the authors of *The Death of Motoring: Car Making and Automobility in the 21st Century*, is centred around two issues: it is becoming increasingly difficult to make money by making, selling and supporting cars and their components; and environmental and social pressures in all parts of the industry are intensifying and becoming broader in scope. Within this context, the authors identify major weaknesses in the industry's current thinking and then go on to explore solutions for more sustainable mobility. Existing ideas about alternatives to the car are used to formulate scenarios dependent on technological, legislative and social change.

Paul Nieuwenhuis and Peter Wells (1997). John Wiley & Sons Ltd., Baffins Lane, Chichester, West Sussex PO19 1UD, UK. Tel: +44 (1234) 77 97 77. Hbk, 257p. ISBN 0-471-97084-0.

Integrated Transport Planning – Beginner's Handbook

This handbook, from the International Institute for Energy Conservation (IIEC), explains how Integrated Transport Planning (ITP) can help cities and metropolitan areas maintain both quality of life and economic competitiveness as they grow. It gives a definition of "integration", describes the benefits for the community, and explains how the ITP approach can assist in goal-setting, coalition-building and implementation. A step-by-step guide to development and implementation of ITP is also provided.

IIEC is a not-for-profit organization which aims to accelerate the adoption of energy efficiency policies, technologies and practices to foster economically and ecologically sustainable development. It has offices in Asia, Europe, Latin America and the United States.

(1996). International Institute for Energy Conservation, 750 First Street, N.E., Suite 940, Washington, D.C. 20002, USA. Tel: +1 (202) 842 388, Fax: +1 (202) 842 1565. Pbk, 80p.

Transport and Communications for Urban Development – Report of the Habitat II Global Workshop

The Habitat II Global Workshop on Transport Communications for Urban Development, held in Singapore on 3-5 July 1995, played an important role in the preparation of the Habitat II conference. The Conclusions and Recommendations

of the workshop have now been published. Four theme papers, four regional overview papers from Africa, Asia, Europe and North America, and 14 papers from all regions, presented at the workshop, are also included.

(1997). United Nations Centre for Human Settlements (Habitat), P.O. Box 30030, Nairobi, Kenya. Tel: +254 (2) 621234, Fax: +254 (2) 624266. Pbk, 432p. ISBN 92-1-131315-5.

CHEMICALS, POLLUTION AND ACCIDENTS

Task Risk Assessment

The European Framework Directive on Minimizing Risk to Workers requires all EU Member States to have legislation in place to encourage improvements in the safety and health of workers. Risk assessment is the basis for this improvement.

The *Task Risk Assessment* report describes and provides examples of how risk assessment for work activities is performed in the petroleum industry, ranging from routine tasks to those involving higher risk or novel circumstances.

(1997). Concawe, Madouplein 1, 1210 Brussels, Belgium. Tel: +32 (2) 220 31 11, Fax: +32 (2) 219 46 46. Pbk, 44p.

Pollutant Release and Transfer Registers, OECD Recommendations to National Governments, Development of the PRTR Concept in Europe

In February 1996, the OECD Council adopted an Act on the use of Pollutant Release and Transfer Registers (PRTRs) as a way of implementing Agenda 21's recommendation that governments, with the cooperation of industry and the public, "implement and improve data bases about chemicals, including inventories of emissions." This Council Act was also adopted as a way of solving certain current problems of lack of coordination in data collection.

The main features of the OECD Council Act, and advice for governments, are outlined in *Pollutant Release and Transfer Registers, OECD Recommendations to National Governments, Development of the PRTR Concept in Europe*, a special edition feature from *Europe Environment*.

Division, 2 rue André Pascal, 75775 Paris Cedex 16, France. Tel: +33 (1) 45 24 82 00, Fax: +33 (1) 45 24 16 75.

Tracking Toxic Chemicals: The Value of Materials Accounting Data

The use of the over 70,000 chemicals in commerce has undoubtedly enriched our lives. Products ranging from durable plastics, solvents and adhesives to life-saving drugs have been made possible by the chemical industry. However, there has also been a flood of toxic materials which can damage health and the environment. In countries' efforts to create "sustainable societies", which means being responsible stewards of natural resources for the use of future generations, one of the greatest challenges is how to safeguard the health of workers, families and children, as well as the environment, from the threats posed by the use of toxic chemicals.

Under the current approach to regulation of chemicals in the United States, it is up to the Environmental Protection Agency (EPA) to show that a chemical poses an "unreasonable" risk to people and the environment. Yet the basic information required to provide such proof – adequate information on toxicity and exposure – does not exist for the vast majority of chemicals in commercial use, and the EPA does not have the capacity to collect such information.

If a more protective strategy is to be created, a first step in avoiding potentially harmful exposures is to identify where and how chemicals are being used. However, nowhere in the US is this information fully available in a comprehensive and publicly accessible form. On the national level, industrial facilities that manufacture or process a reportable chemical in quantities of more than 25,000 pounds per year, or use more than 10,000 pounds of a reportable chemical per year must report their annual releases and transfers to the federal Toxic Release Inventory (TRI), provided the chemicals are among the 600 or so listed by TRI.

New Jersey is one of two states which go beyond TRI reporting and require industrial facilities to report on the quantities of chemicals flowing through them. This includes chemicals that have entered the facility; are consumed in the process; and that leave it, either as waste or in products. This type of reporting is known as "materials accounting data".

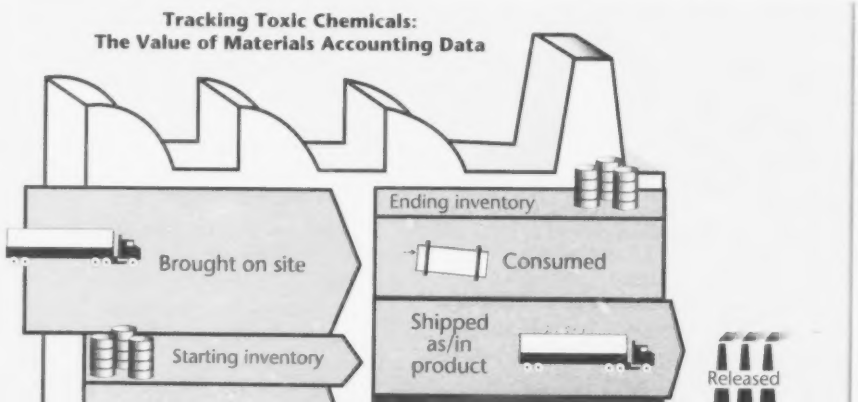
New Jersey's materials accounting database is the subject of *Tracking Toxic Chemicals: The Value of Materials Accounting Data*, which examines its usefulness as a mechanism for tracking both the use of toxic industrial chemicals and product shipments.

Mark H. Dofman and Marian Wise (1997). Inform, Inc., 120 Wall Street, New York, NY 10005-4001, USA. Tel: +1 (212) 361 2400, Fax: +1 (212) 361 2412. Pbk, 80p. ISBN 0-918780-68-3.

Environmental Behaviour of Crop Protection Chemicals

Environmental Behaviour of Crop Protection Chemicals provides the published version of the papers presented to a symposium, organized jointly by the International Atomic Energy Agency (IAEA) and the Food Aid Organization (FAO), on the use of nuclear and related techniques for studying the environmental behaviour of crop protection chemicals.

Pesticides are an integral component of agricul-



tural systems throughout the world. However, their use has costs as well as benefits. In order to help protect the environment, information must be provided on products that make it possible for them to be registered and to provide assurance that they will not represent an unacceptable hazard to non-target organisms. In addition, post-registration surveillance and monitoring studies are necessary to check that the fate and environmental effects of pesticides under field conditions are consistent with predictions.

For a variety of reasons, developing countries often have to rely on data generated elsewhere in order to assess the acceptability of a compound. This symposium was organized to examine the circumstances under which extrapolation from one environment to another is valid on the basis of data generated under comparable conditions. It also considered ways in which relatively simple methods can be used to verify the field applicability of data obtained under sophisticated experimental conditions.

(1997). Sales and Promotion Unit, International Atomic Energy Agency, Wagramerstrasse 5, P.O. Box 100, A-1400 Vienna, Austria. Tel: +43 (1) 2060 22529. Fax: +43 (1) 2060 29302. Pbk, 519p. ISBN 92-0-104596-4.

Health Impacts of Large Releases of Radionuclides

The potential health impacts of large releases of radionuclides have been receiving increasing attention during the last 50 years. Interest in them began at the time of atmospheric testing of nuclear weapons and continued with the growing use of nuclear energy. In the 1970s it was discovered that large amounts of radionuclides are released from other sources, such as volcanic eruptions. There can also be a high level of radionuclides in waste rocks at the surface of some mines. Ten years ago the explosion at Chernobyl released large amounts of radionuclides from the core material of a nuclear reactor into the atmosphere and into aquatic environments.

Health Impacts of Large Releases of Radionuclides contains contributions from leading radioecologists and health scientists on the progress made in understanding the transport processes and exposure pathways of radionuclides. Other topics covered include: the problems and latest techniques of retrospective quantification of the actual doses received by individuals; the time course of effects of exposure in relation to structure and function at the cellular tissue, organ and whole organism levels; the genetic effects, and effects on

Guidelines for Integrating Process Safety Management, Environment, Safety, Health and Quality

Guidelines for Integrating Process Safety Management, Environment, Safety, Health and Quality, from the Center for Chemical Process Safety of the American Institute of Chemical Engineers (AIChE) shows the effectiveness and benefits of integrating process safety management (PSM) and environment, safety, and health (ESH) systems within the framework of management programmes. It explains how integration can reduce costs by reducing the number of management programme steps and avoiding redundancy; how it results in more effective programmes, since the best practices can be combined into a single process; and how integration brings faster, cost-effective response to new demands. The book, written by a team of chemical industry safety, health and operating professionals, also describes a step-by-step process for achieving the desired integration and accompanying benefits.

The Center for Chemical Process Safety (CCPS) was established by AIChE in 1985 to focus on engineering and management practices to help prevent and mitigate catastrophic accidents which involve the release of hazardous chemicals and hydrocarbons. CCPS is active worldwide through its publications, seminars and conferences, and research. It also produces safety curricula materials for undergraduate education.

(1996). AIChExpress Service Center, 345 East 47th Street, New York, NY 10017-2395, USA. Tel: +1 (800) 242 4363, Fax +1 (800) 212 705/8400. Hbk, 173p. ISBN 0-8169-0683-1.

Guidelines for Postrelease Mitigation Technology in The Chemical Process Industry

The safe operation of chemical facilities, and protection of people and their environment, are requirements for creating long-term social and economic benefits for the community and industry. Many of the major accidents in the chemical process industry have involved the release of toxic vapours or the ignition of flammable vapours. The purpose of *Guidelines for Postrelease Mitigation Technology in The Chemical Process Industry*, also from AIChE (see preceding review), is to address current engineering methods for minimizing the consequences of these types of releases once they have occurred.

(1996). AIChExpress Service Center, 345 East 47th Street, New York, NY 10017-2395, USA.

ment, health and safety). It includes information from 22 companies which together represent over 80 per cent of the oil refining capacity in Europe. It is therefore intended to give a representative sample of the industry rather than a complete picture.

(1997). CONCAWE, Madouplein 1, B-1030 Brussels, Belgium. Tel: +32 (2) 220 34 11, Fax: +32 (2) 219 46 46. Pbk, 16p.

Industrial Analysis with Vibrational Spectroscopy

This title in the "Analytical Spectroscopy Monographs" series is an integrated work which emphasizes the synergy and complementary nature of the infrared and Raman spectroscopy techniques in industrial laboratories. It provides a developed, realistic insight into industrial analysis with vibrational spectroscopy for both undergraduates and academic researchers, while also providing a straight- forward tool of value to the industrial laboratory worker.

John M. Chalmers and Geoffrey Dent (1997). Royal Society of Chemistry, Turpin Distribution Services Ltd., Blackhorse Road, Letchworth, Herts SG6 1HN, UK. Tel +44 (1462) 672555, Fax +44 (1462) 480947. Hbk, 380p. ISBN 0-85404-565-1.

Ground Chemistry: Implications for Construction

The disturbance of the ground chemistry status quo at a given site can give rise to problematic situations. For example, a change in conditions may lead to undesirable chemical reactions or the creation of environments particularly conducive to the proliferation of bacteria. The disposal of contaminated materials and the use of contaminated land are also subjects of concern. Such topics, of importance to engineers and environmentalists, were discussed at the International Conference on the Implications of Ground Chemistry and Microbiology for Construction, hosted by the University of Bristol, UK, in 1992. The full proceedings of the conference are now available in book form.

A. Brian Hawkins, ed. (1997). A.A. Balkema, P.O. Box 1675, 3000 BR Rotterdam, Netherlands. Fax: +31 (10) 4135947. Hbk, 658p. ISBN 90-5410866-5.

Petroleum Bioventing

Petroleum bioventing is a new technique for in-situ removal of petroleum hydrocarbons from

Controlling Environmental Risks from Chemicals – Principles and Practice

This book brings information, and hopefully insight, to those who need an overview of how industrial chemicals are controlled in the interests of environmental protection. The focus is on the principles and practices of ecological risk assessment and cost-benefit analysis. Questions such as "What are we trying to protect?" and "How is a cost-benefit analysis undertaken?" are answered. The book also shows how principles are incorporated into legislation, with special reference to EU Directives and Regulations, balanced by a review of US and international legislation and policies.

Peter Calow (1997). John Wiley & Sons Ltd., Baffins Lane, Chichester, West Sussex PO19 1UD, UK. Tel: +44 (1243) 779777. Hbk, 136p. ISBN 0-471-96995-8.

Measurements and Modelling in Environmental Pollution

A true understanding of environmental problems requires a balanced integration of measurement and modelling. Increased computer capacities and the techniques of numerical analysis, combined with the principles of physics, chemistry and environmental science, are being used by environmental professionals and will be even more important in the future. *Measurements and Modelling in Environmental Pollution*, which contains the presentations given at the First International Conference on Measurements and Modelling in Environmental Pollution in Madrid in 1997, explains how techniques of measurement and modelling can be integrated. The book presents over 50 papers covering water and air pollution modelling, meteorological modelling, agricultural pollution, and urban waste.

R. San José and C.A. Brebbia, eds. (1997). Computational Mechanics Publications, Ashurst Lodge, Ashurst, Southampton SO40 7AA, UK. Tel: +44 (1703) 293223, Fax: +44 (1703) 292853. Hbk, 537p. ISBN 1-85312-461-3.

IPCS Environmental Health Criteria publications and Health Safety Guides

The International Programme on Chemical Safety (IPCS) is a joint venture between UNEP, the International Labour Organisation and the World Health Organization (WHO). Publications in the Environmental Health Criteria (EHC) series

The most recent titles are:

EHC 188 – Nitrogen Oxides *(1997). Pbk, 549p. ISBN 92-4-157188-8.*

EHC 189 – Di-*n*-butyl Phthalate *(1997). Pbk, 205p. ISBN 92-4-157189-6.*

EHC 190 – Xylenes *(1997). Pbk, 147p. ISBN 92-4-157190-X.*

Two new IPCS Health and Safety Guides are also available:

HSG – Acrylic Acid (companion to EHC 191: Acrylic Acid). *(1997). Pbk, 32p. ISBN 94-4-151104-4.*

HSG – 105 - Methanol (companion to EHC 196: Methanol). *(1997). Pbk 32p. ISBN 92-151105-2.*

WASTE MANAGEMENT

The Science of Composting

This book addresses compost's role in waste management, humus formation, plant growth, conservation and the environment. It provides insight into microbial behaviour on a large scale.

Eliot Epstein (1997). Technomic, P.O. Box 3535, 851 New Holland Avenue, Lancaster, PA 17604-9961, USA. Tel: +1 (717) 291 5609, Fax: +1 (717) 295 4538. Hbk, 487p. ISBN 1-56676-478-5.

The Market for Pyrolysis and Gasification of Waste in Europe

This report covers 22 different processes being marketed as new thermal treatment methods for mixed waste streams, such as municipal solid waste. Only a handful of plants use these processes in Europe today, and many of these are demonstrator facilities. However, the market appears poised to take off. The main objectives of this study are to predict the rate of growth and analyse which processes will be most successful at capturing a part of the market.

(1997). Juniper Services Ltd., Sheppards Mill, Uley, Gloucestershire, GL11 5SP, UK. Tel: +44 (0) 1453 8607050, Fax: +44 (0) 1453 860882. Pbk, 185p.

WATER

Safeguarding Water Resources for Tomorrow: New Solutions to Old Problems

The theme of the 1996 Symposium was *Safeguarding Water Resources for Tomorrow: New Solutions to Old Problems*. Special workshops addressed intersectoral competition for water; groundwater for the next generation; reducing the risk of water-related diseases; fulfillment of water supply and sanitation objectives; capacity building for integrated water management; communication to bridge different water perspectives; and microbiological complexity in wastewater treatment.

Stockholm Vatten AB, Stockholm Water Company, Sweden. Pbk, 329p. ISBN 91-971929-1-0.

NATIONAL/REGIONAL

Cleaner Production and Small Enterprise Development in Kenya

Kenya is striving to become an industrialized country by the year 2000. The Kenyan government's policy emphasizes the role in the country's industrialization of the small-scale and *Jua Kali* (informal micro-enterprises) sector. It is also stressed that industrial development must adhere to standards of environmental protection and resource conservation. Kenyan industry must pursue more efficient use of energy and resources, minimize waste, and have proper waste disposal management.

Cleaner Production and Small Enterprise Development in Kenya is the outcome of a seminar on small-scale industries and environmental pollution, held in Nairobi in February 1997, to which the findings of a cooperative Kenyan-Dutch research project, "Small-scale Industries and Environmental Pollution in Kenya", were presented.

Jos Frijns and Joyce M. Malombe, eds. (1997). Centre for the Urban Environment, P.O. Box 1935, 3000 BX Rotterdam, The Netherlands. Pbk, 116p. ISBN 90-6433-019-0.

Key Indicators of Developing Asian and Pacific Countries

Key Indicators of Developing Asian and Pacific Countries is an annual statistical publication of the Asian Development Bank presenting the most current economic, financial and social data on the Bank's developing member countries (DMCs). There is a compilation of standard socio-economic data comparable among DMCs, including, for the first time, Uzbekistan and Nauru. New country tables are presented for Kazakstan and Kyrgyz.

(1996). Publications Unit, Information Office, Asian Development Bank, P.O. Box 789, 0980

ganization during 1996, with a special focus on the launch of the Green Productivity movement in the Asia-Pacific region. The concept of Green Productivity, which is part of the organization's Special Program for the Environment, aims to provide a new paradigm for socio-economic development. Green Productivity encourages economic growth and better productivity. At the same time, it protects the environment by making concerted efforts to adopt cleaner production processes throughout industry and in agriculture, and to strengthen international cooperation in this regard.

Asian Productivity Organization, 4-14 Akasaka 8-chome, Minato-ku, Tokyo 107, Japan. Tel: +81 (3) 3408 7221, Fax: +81 (3) 3408 7720. Pbk, 82p. ISBN 92-833-1521-9.

Preparing the Workforce for the 21st Century

The rapid development of new technologies has placed new demands on manufacturing systems, and on managers and workers. A marked shift is occurring from mass production to a new form of production known as "customized products", based on flexible manufacturing.

To take advantage of these opportunities and meet new challenges, it is essential to develop new skills. It is also important to design new approaches to training and programmes for skill upgrading. To cope with the qualitative aspects and varied nature of work created by new technologies, there needs to be a shift in the focus of human relations skills as well as of technical ones.

Recognizing the necessity to enhance member countries' capacity to cope with new technologies, the Asian Productivity Organization (APO) organized a study meeting in Singapore in 1995. The in-depth discussions, deliberations and recommendations of participants have now been compiled in *Preparing the Workforce for the 21st Century*.

(1997). Asian Productivity Organization, 4-14 Akasaka 8 chome, Minato-Ku, Tokyo 107, Japan. Tel: +81 (3) 3408 7221, Fax: +81 (3) 3408 7220. Pbk, 353p. ISBN 92-833-2200-2.

Professional Development of Environmental Managers: A Vision for the 21st Century

In December 1996, UNEP's Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP) hosted a regional conference in Thailand on "Professional Development of Environmental Managers: A Vision for the 21st Century". At the conference innovators

+254 (2) 623491, Fax: +254 (2) 624269. Pbk, 286p.

Promoting Green Productivity through Mutual Cooperation in the Asia-Pacific Region

This brochure describes the work of the Asian Productivity Organization (APO), with an emphasis on its dissemination of the Green Productivity concept which aims to integrate environmentally friendly mechanisms with overall productivity improvement practices (see above).

(1996). Asian Productivity Organization, 4-14 Akasaka 8-chome, Minato-ku, Tokyo 197, Japan. Tel: +81 (3) 3408 7222, Fax: +81 (3) 3408 7220. Pbk, 25p.

Hazardous Materials Management, Storage and Disposal

This booklet is one of a series on "Best Practice in Environmental Management in Mining" from Environment Australia (intended to help all sectors of the mining industry – minerals, coal, oil and gas – protect the environment and reduce the impacts of production processes by following the principles of ecologically sustainable development).

The booklets include examples of current best practice in environmental management in mining from some of the recognized leaders in the Australian mining industry. They address key issues by presenting: basic principles, guidance and advice; case studies from leading Australian companies; and useful reference checklists.

Office of the Supervising Scientist, Environment Australia, 40 Blackall Street, Barton Act 2600, Australia. Tel: +61 (6) 274 1832, Fax: +61 (6) 274 1519. Pbk, 71p.

Managing Sulphidic Mine Wastes and Acid Drainage

Another booklet in the "Best Practice in Environmental Management in Mining" series from Environment Australia (see above).

Office of the Supervising Scientist, Environment Australia, 40 Blackall Street, Barton Act 2600, Australia. Tel: +61 (6) 274 1832, Fax: +61 (6) 274 1519. Pbk, 84p.

Development of an Ecolabel Certification Programme for Hong Kong

In most countries where they have been introduced, eco-labelling programmes (ELPs) are seen

customers' requirements for cleaner products. Moreover, there is concern in exporting countries about the effects on trade of future environmental certification.

Development of an Ecolabel Certification Programme for Hong Kong is the result of a study commissioned the Hong Kong Industry Department from the Hong Kong University of Science and Technology, in collaboration with the Hong Kong Productivity Council. The report draws on two major sources of information: the experience of countries which already have such a programme or are about to establish one; and the views of Hong Kong industries. Conclusions and recommendations based on an analysis of this information are included. Comprehensive reports of site visits during which the information was collected are presented in an Appendix.

(1997). Institute for Environmental Studies, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong. Tel: +852 (2358) 6908, Fax: +852 (2358) 1582. Pbk, 78p (report) + Pbk, 250p (Appendix).

MAP Technical Reports Series Nos. 111, 112, 113, and 114

The Mediterranean Action Plan (MAP) Technical Reports Series consists of selected reports resulting from the activities carried out within the framework of the components of the Mediterranean Action Plan: Pollution and Research Programme (MED POL), Blue Plan, Priority Actions Programme, Special Protected Areas and Regional Marine Pollution Emergency Response Centres for the Mediterranean. Six new reports are now available:

No. 111: *Guidelines for Treatment of Effluents Prior to Discharge into the Mediterranean Sea.* Pbk, 247p. ISBN 92-807-1618-2.

No. 112: *Guidelines for Submarine Outfall Structures for Mediterranean Small and Medium-Sized Coastal Communities.* Pbk, 98p. ISBN 92-807-1618-2.

No. 113: *Final Reports of Research Projects on Transport and Dispersion (Research Area II) – Modelling of Eutrophication and Algal Blooms in the Thermaikos Gulf (Greece) and Along the Emilia Romagna Coast (Italy).* Pbk, 118p. ISBN 92-807-1624-7.

No. 114: *Workshop on Policies for Sustainable Development of Mediterranean Coastal Areas.* Pbk, 184p. ISBN 92-807-1626-3.

No. 116: *Data Quality Review for MED POL (1994-1995) – Evaluation of the Analytical Performance of MED POL Laboratories during 1994-1995 in IAEA/UNEP Laboratory Performance Studies for the Determination of Trace Elements*

Social Responsibility and the Company: A New Perspective on the Governance, Strategy and the Community

This book explores corporate social responsibility in New Zealand from a business perspective, placing it in the context of current policy settings and the changing demands of competition, both of which govern sustainable business performance and are changing the terms on which companies must manage their environments.

Adrienne von Tunzelmann with David Cullwick (1996). Institute of Policy Studies, Victoria University of Wellington, P.O. Box 600, Wellington, New Zealand. Pbk, 120p. ISBN 0-908935-14-5.

Industrial Metabolism – Extended Definition, Possible Instruments and an Australian Case Study

The concept of industrial metabolism compares the functioning of typical industrial entities (economic plants or companies) with those of typical biological organisms, each having particular inputs, outputs, regulating processes, and links to the wider environment without which they cannot survive.

To date, industrial metabolism studies have focused on flows of individual industrial "nutrients" (such as heavy metals, hazardous wastes and chemical pollutants) with the goal of reducing chemical pollution by improving technology and restructuring the economy. *Industrial Metabolism – Extended Definition, Possible Instruments and an Australian Case Study* extends the definition of industrial metabolism to include consideration of the Industrial Ecology and Material Intensity Per Unit of Service (MIPS) approaches to materials accounting and sustainable development. Political, economic, technological, informational and social instruments aimed at pushing forward the industrial metabolism concept are identified and described. The report includes an Australian case study which illustrates the methodology of the extended concept and highlights possible key natural and anthropological forces driving industrial material flows.

Andria Durney (1997). Wissenschaftszentrum Berlin für Sozialforschung (WZB), Science Center Berlin, Information Department, Reichpietschufer 50, D-10785 Berlin, Germany. Pbk, 94p.

Japan's Experience in the Battle Against Air Pollution

environmental challenges. It focuses on air pollution as the most significant form of pollution resulting directly from the use of energy during economic development. This report is in some ways a sequel to the 1991 publication *Pollution in Japan – Our Tragic Experiences*, published just prior to UNCED, which demonstrated that exercising pollution control before emission is more economical than reacting afterwards. The new report goes beyond the purely economics-based view of Japan's air pollution experience to give a frank assessment of the successes and shortcomings of governmental, industrial and popular efforts.

(1997). The Pollution-Related Health Damage Compensation and Prevention Association, Japan. Pbk, 151p.

US-EAP Country Assessment

This report summarizes the information and findings of an assessment carried out in 1996 by the United States-Asia Environmental Partnership Program (US-EAP) to evaluate the convergence between environmental policies and the underlying determinants of urban and industrial development in ten Asian countries.

Operating in countries as different as India and Singapore, for example, US-EAP assessors examined market forces, government policies, and public, cultural and community factors affecting the dynamics of environmental, industrial and urban management. The assessments give a clear picture of relatively complex trends, point to future opportunities throughout the region, and provide a practical guide for US-EAP initiatives.

(1997). US-EAP, 1720 Eye Street, Suite 700, Washington DC 20006, USA. Tel: +1 (202) 835 0333, Fax: +1 (202) 835 0366. Pbk, 235p.

DIRECTORIES

Directory of NPOs

The Asian Productivity Organization (APO) has published a directory of its member National Productivity Organizations (NPOs). APO was founded in 1961 to increase productivity and, consequently, to accelerate economic development in the Asia-Pacific region. A unique feature of APO is its close networking with the National Productivity Organizations (NPOs), which are either branches of government or statutory bodies established to promote productivity within APO's 18 member states.

During its lifetime, APO has progressed from

MIACC Catalogue

The Major Industrial Accidents Council of Canada (MIACC) is an independent, not-for-profit organization working with government, industry, communities and other entities to minimize the risk to public safety and the environment from major industrial accidents involving hazardous substances.

MIACC produces up-to-date, practical information on: risk management; process safety management; life cycle analysis; emergency planning; and education. The *MIACC Catalogue* lists a range of sources of such information.

Major Industrial Accidents Council of Canada, 265 Carling Avenue, Suite 600, Ottawa, Ontario K1S 2E1. Tel: +1 (613) 232 4435, Fax: +1 (613) 232 4915. Pbk, 22p.

South East Asia Iron and Steel Institute Directory – 1997

The South East Asia Iron and Steel Institute (SEAISI) is a professional institute representing the iron and steel industry in South East Asia. Its mission is to promote the development of the industry in the region by fostering regional cooperation, technical exchanges and project assistance at all levels. The SEAISI Directory gives the names and contact details of members.

South East Asia Iron and Steel Institute, P.O. Box 7094, 40702 Shah Alam, Selangor Darul Ehsan, Malaysia. Tel: +60 (3) 559 1102, Fax: +60 (3) 559 1159. Pbk, 150p. ISBN 0129-6922

Environmental Guide to the Internet

The *Environmental Guide to the Internet* provides help to professionals who need to locate environment-related information on the Internet quickly and easily. The detailed guide lists over 200 discussion groups, 35 Usernet news groups, 126 electronic journals and newsletters, and 523 World Wide Web sites.

Carol Briggs-Erickson and Toni Murphy (1997). Government Institutes Inc., 4 Research Place, Rockville, Maryland 20850, USA. Tel: +1 (301) 921 2355, Fax: +1 (301) 921 0373. Pbk, 383p. ISBN 0-86587-2.

Chemical Guide to the Internet

The objective of this guide is to help readers locate electronic information on the subject of chemicals and associated fields. It contains entries covering six major areas: federal agencies that implement and enforce laws and regulations relating to chemicals; chemical industries which

cal-related activities.

C.C. Lee (1997). Government Institutes Inc., 4 Research Place, Rockville, Maryland 20850, USA. Tél: +1 (301) 921 2355, Fax: +1 (301) 921 0373. Pbk, 295p. ISBN 0-86587-519-7.

KFEM Directory

The Korean Federation for Environmental Movement (KFEM) has published a directory describing 131 environmental organizations worldwide. Detailed descriptions are given in Korean, but organizations' names, addresses, and telephone and fax numbers are given in English or in the original language when this is not English.

(1997). Korean Federation for Environmental Movement, (110-042) Nooha-dong 251, Chongro-ku, Seoul, Korea. Tél: +82 (2) 735 7000, Fax: +82 (2) 730 1240. Pbk, 188p.

EDITIONS FRANCAISES

Eco-Guide Professionnel

Eco-Conseil présente deux nouvelles brochures dans la série *Eco-Guide Professionnel* destinées aux professionnels de l'automobile et de la charpente. Le but de cette série est d'encourager les professionnels des différents métiers à découvrir et à mettre en pratique les Eco-Gestes, des comportements simples et faciles à adopter ayant un double objectif : préserver la santé des personnes; et préserver l'environnement afin de maintenir notre cadre de vie. Les Eco-Guides se présentent sous forme de petit classeur contenant des fiches décrivant des actions quotidiennes en faveur de l'environnement.

Eco-Conseil Entreprise, 31 Grand'Rue, 68200 Mulhouse, France. Tél: +33 (03) 89 45 50 99, Fax: +33 (03) 89 45 83 59.

Eco Lobby – dossier spécial : les OGMs

L'introduction d'organismes génétiquement modifiés dans la chaine alimentaire suscite actuellement peurs et colères chez les consomateurs, souvent renforcées par l'amalgame qui fleurit dans une certaine presse et chez certains groupes de pression. Dans ce numéro spécial du trimestriel Eco Lobby, d'éminentes personnalités du monde universtaire donnent leurs points de vue et essaient de clarifier ce sujet controversé.

Groupe Consommation asbl, 53 rue de la Concorde, 1050 Bruxelles, Belgique. Tél: +32 (02) 512 47 40, Fax: +32 (02) 252 57 93.

Sylviculture 2 : la gestion des forêts irrégulières et mélangées

La sylviculture est arrivée à un tournant décisif de son évolution. Jusqu'à il y a peu de temps encore, on la voyait essentiellement comme une technique biologique destinée à l'exploitation de la ressource bois et des autres fonctions classiquement reconnues de protection et de récréation. Avec l'évolution sociale, la forêt est perçue aujourd'hui par la grande majorité des gens dans les sociétés industrialisées non plus comme une fabrique à bois, mais comme un cadre vital, un microcosme tutélaire. De ce fait, les méthodes de sylviculture sont en train d'évoluer considérablement sous la contrainte des rendements toujours plus déficitaires de la mise en valeur de la ressource bois et sous celle de l'augmentation des besoins des autres usagers de la forêt. Il est nécessaire de mieux prendre en compte les processus évolutifs naturels qu'on appelle automation biologique. Cet ouvrage focalise l'attention sur ce genre de concept de sylvicutlture polyvalente et auto-évolutive.

Presses Polytechniques et Universitaires Romandes, EPFL – Centre Midi, CH-1015 Lausanne, Suisse. Tél: +41 (021) 693 21 30, Fax: +41 (021) 693 40 27. Poche, 178p.

Acquisition ou vente d'un site industriel – fiches d'alerte environnement

L'acquisition d'un site industriel ne peut plus se concevoir sans qu'une attention particulière ne soit portée à sa situation au regard de l'environnement. *Acquisition ou vente d'un site industriel – fiches d'alerte environnement* se compose de plusieurs fiches simplifées, appellées fiches d'alerte environnement, destinées à un responsable non spécialisé dans les problèmes d'environnement, qui les utilisera dans les premières phases d'une démarche d'acquisition d'un site pour en évaluer la sensibilité environnementale. Les fiches couvrent plusieurs aspects de la question environnement allant de la sensibilité du milieu aux émissions polluantes et aux investissements et dépenses pour sa protection. La méthodologie proposée est compatible avec la norme ISO 14015 "Audit d'acquisiton des sites", en préparation.

Entreprise pour l'Environnement, 95 rue des Trois Fontanot, BP 523, 92005 Nanterre Cedex, France. Tél: +33 (01) 47 24 64 55, Fax: +33 (01) 47 24 61 77. Classeur, 27p.

Plan d'Action pour la Méditerranée

Deux nouveaux titres dans cette série de rapports sont disponibles :

N° 115 – *Méthodes et outils pour les études systémiques et prospectives en Méditerranée.* Poche, 135p. ISBN 92-807-1627-1.

N° 117 – *La convention de Barcelone pour la protection de la mer Méditerranée contre la pollution et le développement durable.* Poche 102p. ISBN 92-807-1669-7.

Unité de coordination du Plan d'Action pour la Méditerranée, Programme des Nations Unies pour l'environnement, Leoforos Vasilissis Konstantinou, 48, B.P. 18019, 11610 Athènes, Grèce. ◆

Environmental Management of Industrial Estates

Thank you for the material you sent me recently. All of the material corresponds exactly to my area of interest. I found Volume 19 N° 4 of *Industry and Environment*, on the subject of Environmental Management of Industrial Estates, particularly useful and interesting.

Adriana M. Véscovo
Aguilar 2275, P. 5° B
1426 Buenos Aires
Argentina

Product development and the environment

I am a designer with a practice based in the UK. I am also involved in research in conjunction with several universities. I write to thank you for the recent issue of *Industry and Environment* dealing with sustainable products. This was most interesting and informative, especially the Facts and Figures section. I hope you are considering similar coverage in the future.

Michael Dye
Senior Partner
MDA
Whaplode House
Spalding
UK

Correction

The author of the article "*Incorporating environmental issues in product design and realization,*" which appeared in Volume 20, N° 1-2 (January-June 1997) of *Industry and Environment*, has asked us to point out that two errors were introduced into Figures 3 and 4, on page 9 of the article, during the production stages of the review. The corrected versions of the figures are shown below (corrections circled in blue).

Also on page 97 of the same issue, in the article entitled "*Calvià, Mallorca: report on Local Agenda 21*", (Tourism Focus section), the numbers of visitors and the accommodation capacity given in the first paragraph are incorrect. The sentences should have read, " Each year it is visited by 1,200,000 tourists. Calvià has the capacity to accommodate 120,000 visitors."

Industry and Environment *apologizes for any inconvenience caused by these errors.*

Figure 3
Increasing levels of organizational design concern

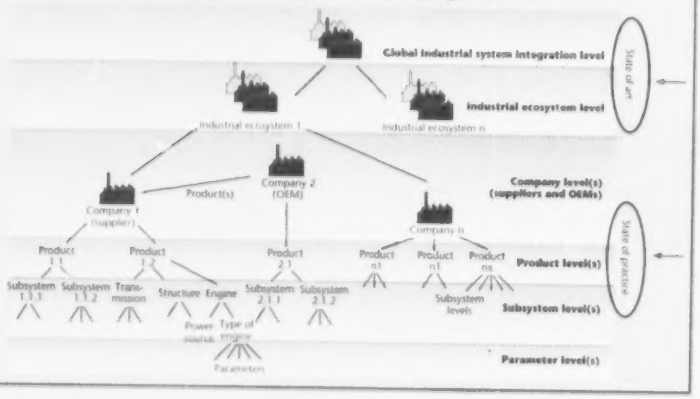
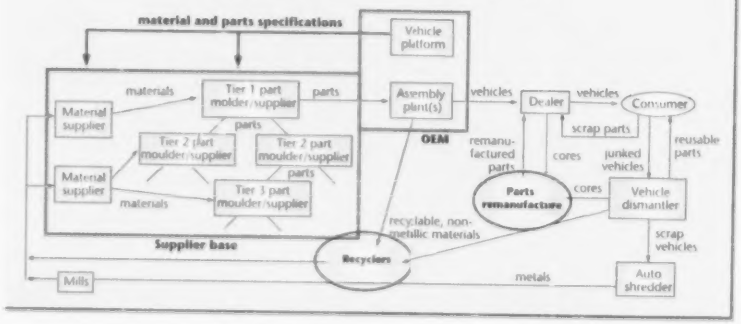


Figure 4
Vehicle life cycle and industrial interest groups



THE ROLE OF UNEP INDUSTRY AND ENVIRONMENT

It is now widely accepted that sustainable development and a sound environment go hand-in-hand. UNEP recognized this as early as 1975 when it established the Industry and Environment centre (IE), located in Paris. UNEP IE functions as a catalyst to bring industry, government and non-governmental organizations together to work towards environmentally sound forms of industrial development. UNEP IE seeks to:

- define and encourage the incorporation of environmental criteria in industrial development;
- help formulate policies and strategies for sustainable industrial development and facilitate their implementation;
- promote preventive environmental protection through cleaner production and other pro-active approaches; and
- stimulate the exchange of information on environmentally sound forms of industrial development.

To achieve these goals, UNEP IE has developed programmes in the fields of Awareness and Preparedness for Emergencies at Local Level (APELL), Cleaner Production, Tourism, Energy, and other sector-specific activities. The OzonAction Programme, under the Multilateral Fund, is also based at UNEP IE. UNEP IE organizes conferences and seminars, undertakes training activities and demonstration projects, and produces practical supporting publications.

To promote the transfer of information and experience, UNEP IE has developed:

- The *Industry and Environment* quarterly review;
- A *Query-Response Service*, which responds to specific technical queries on a wide range of subjects related to industrial pollution;
- *Outreach Activities*, which address a broad range of issues concerning industry as a whole. UNEP IE develops partnerships with industry, government and non-governmental organizations, organizes consultative meetings, and publishes supporting documents aimed at spreading new developments in the field of sustainable development.
- A *Technical Report Series*, policy reports and training materials, which provide practical information to readers throughout the world. For a list of available publications, please contact UNEP IE.
- Information and exchange clearinghouses, which provide the latest news on cleaner production and OzonAction related activities.
- UNEP IE's Web site, to encourage and support the adoption of environmentally-sound technologies and environmental management methods.

UNEP
UNITED NATIONS ENVIRONMENT PROGRAMME
INDUSTRY AND ENVIRONMENT

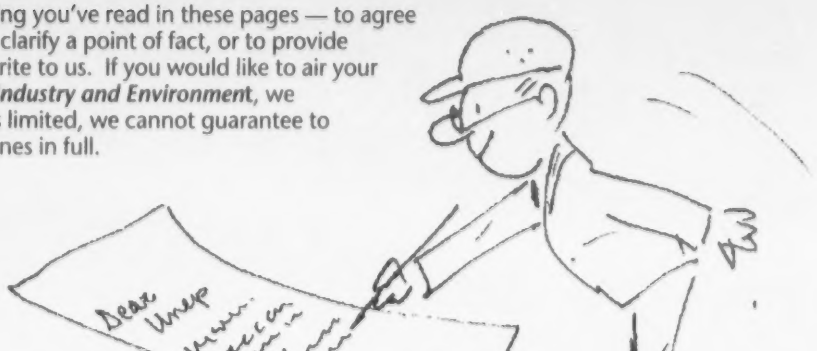
39-43, QUAI ANDRE-CITROEN
73739 PARIS CEDEX 15 - FRANCE
TEL : (33) 01 44 37 14 50
FAX : (33) 01 44 37 14 74
E-MAIL : unepie@unep.fr
http://www.unepie.org/home.html

FEEDBACK

If you would like to respond to something you've read in these pages — to agree or to take issue with a point of view, to clarify a point of fact, or to provide information on a particular aspect — write to us. If you would like to air your views on any other subject relevant to ***Industry and Environment***, we would like to hear from you. As space is limited, we cannot guarantee to publish all letters, nor to publish long ones in full.

Send your Feedback letters to:

Feedback
Industry and Environment Review
UNEP IE
Tour Mirabeau



Industry and Environment Review

a publication of the United Nations Environment Programme
Industry and Environment – UNEP IE

For more than fifteen years, the ***Industry and Environment*** quarterly review has provided a forum for the exchange of research and experience, presenting articles written by and for industry managers, government officials and researchers in the field of sustainable industrial development. In addition to features, news and developments of broad international interest, each issue of the review focuses on a particular theme. Recent issues have covered such varied topics as climate change and industry, education and training, managing contaminated land, transport, and sustainable tourism development. For a complete list of past issues and their availability, contact UNEP IE.

The next issue of ***Industry and Environment*** will focus on the theme of sustainable mining development.

While ***Industry and Environment*** is an English language publication, it also includes articles in French and Spanish. All contributed articles are accompanied by summaries in English, French and Spanish.

环境署

The review is also available in Chinese. For further details, please contact:
Professor Chen Dingmao, Research Center for Eco-Environmental Sciences, Academia Sinica, P.O. Box 2871, Beijing 100085, China.

INDUSTRY AND ENVIRONMENT SUPPLEMENTS

The ***Industry and Environment*** review includes four semi-annual supplements: the *APELL*, *Cleaner Production* and *EnTA* newsletters, and *Tourism Focus*.

UNEP IE's APELL programme – Awareness and Preparedness for Emergencies at Local Level – seeks to minimize the occurrence and impact of industrial accidents. The newsletter keeps readers up-to-date on APELL programmes currently in progress around the world.

Cleaner Production

The Cleaner Production newsletter provides information on cleaner technologies and products, actions by governments and organizations to promote cleaner production, and the UNEP IE Cleaner Production activities and network.

EnTA

The EnTA newsletter reports on technology assessment as a tool to develop environmentally sound technologies and to discourage the export of those that pose potential environmental hazards.

Tourism Focus reports on developments in the field of sustainable tourism and on the activities of the UNEP Tourism Programme.

INDUSTRY AND ENVIRONMENT SUBSCRIPTION ORDER FORM

Name: _____ **Date:** _____
Title: _____
Department: _____
Organization: _____
Address: _____
Annual subscription: US$ 60.00

Note: Institutions and public libraries may request billing.
Commercial firms and individuals, please send payment along with order form.

- **Payment can be made as follows:**
  Send cheque in US$ payable to IWSS LTD